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Article IV -3A

PART C

DATA PACKAGE VOLUME III - SYSTEM DATA

FLIGHT MODEL PRESHIPMENT REVIEW

Greenbeit, Maryland 20771 **CONTRACT NAS 5-24200** 

**GODDARD SPACE FLIGHT CENTER** 

Prepared for

HEMATIC MAPPER

Barbara Research Center) HC A 10 /MF A 01

PART C: SYSTEM DATA Final Report (Santa

PRESHIPMENT REVIEW DATA PACKAGE.

(E83-10263) THEMATIC MAPPER FLIGHT MODEL

N83-26132

VOLUME 3, CSCL 14B G3/43

Unclas 00263

THEMATIC MAPPER

SEPT 1982



Present for GOODARD SPACE FLIGHT CENTER Greenbeit, Maryland 20771 CORTRACT NAS 5-24200

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## 4.0 SUMMARY OF LIENS

Data contained in this section summarizes the Failure Report and Request for Deviation/Waiver data presented in each of the subsystem sections of Volume II. Groies of liens written against the system (complete instrument) are also included herein.

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## 4.1 FAILURE REPORTS

The following pages list each Failure Report associated with the Flight Model Thematic Mapper, with the symptom and cause of the failure, and corrective action taken. Each Failure Report listed is keyed to the major subsystem against which the failure occurred.

Copies of Failure Reports for failures occurring at the subsystem level are included in Volume II of this data package. Copies of reports for failures occurring at the system level follow the listing in this section.

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	
FL	F0372	Multiplexer	003	Serial Data output pattern has wrong format	Operator error	Reworked/retested unit Operator instructed to check alternate wiring.	c	
FL	F0373	Multiplexer	003	A/D reference voltages of Band 1&5 were low.	Operator error	Reworked/retested unit Operator instructed to verify wiring to blue print.	С	
FL	F0374	Multiplexer	003	At input buffer DC response test, output readings of all sensors are wrong.	Workmanship	Reworked/Retested. Straightened all pins. Operator cautioned to use more care when working with hardware.	c	OR:
FL	F0381	Multiplexer	003	After incorporating SMA EO. No backup SMA clock output	Rough Handling	Test operator and rework operator were cautioned to use more care.	С	ORIGINAL P
FL (ALL)	F0527	Prime Focal Plane	ALL	High resistance backside contact at interface between silicon detector and Quartz substrate.	Design	New detectors will be fabricated for Protoflight using Waidon 3020 conductive epoxy.	c	PAGE <b>IS</b> QUALITY
FL	F0530	Telescope/ Main Frame	002	Out-of-Flatness condition (less than 0.001 inch) between Telescope Mounting Flange and Main Frame mounting surface.	MFG Procedure	Assembly technique has been changed to bond the mirror after the telescope has been bolted to its interface.	C	
FL	F0552	Telescope/Mai Frame	in 002	Specification Requirements were higher than required for operation within system specifica- tions.	Test Procedure	MTF acceptable per Waiver W-136.	c	

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evel	#	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Open/Closed	
FL	F0553	Relay Optics Assy.	003	Inchworm No. 2 command on test box (using Flight IPS) Vields no motion in "down" (retract) direction.	Test Equip.	Engr. erroneously marked up drawing. He was instructed to use more caution when making up future drawings.	C	
FL	F0554	Aft Optics Assy.	003	SLC functional test, AHR 51512 operation 173,001 P/N 3 to 11, 4 to 12.	MGF Procedure	All parties concerned have been advised of the importance of cross-checking assembly P/N's and S/N's against the ABCTR's.	С	
FL	F0555	Relay Optics Assembly	003	Inchworm No. 2 and on test box yields low MV readings perstep during first steps in either direction, subsequent steps in "down" direction are small approx. 1 to 2 MV.	Test Equipment	Engr. erroneously marked up drawing. He was instructed to use more caution when marking up future drawings.	of Poor Q	ORIGINAL F
FL	F0560	Prime Focal Plane	203	Ch. 1 and 7 were pegged at -25V. Ch's 2,3,5 and 8 exceed wide band noise spec.	Defective parts	Fets replaced and retested successfully. Corrected action for defec FETS not required.	C Live	PAGE IS
FL	F0581	Prime Focal Plane	201– 207	Led Current used for test to low.	Test. Proc.	Test Procedure changed to increase LED drive current to 35%. See ECR 1237101 to Rev. Box 16660.	c	
FL	F0591	Cold Focal Plane	003	Coating witness sample failed scotch tape test after humidity test at SBRC.	Design	Witness samples were test above design limits. Rev. D of drawing 50825 adds tolerances for temp. and humidity.		

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Close	
FL	F0606	Electronic Module	201	Test spec. 16368 in error	No failure	Test Procedure error. E09732 corrects spec. 16368.	С	
FL	F0620	Prime Focal Plane	201	Crosstalk shields not adjusted correctly.	Workmanship	Oper. instructed to make sure proper adjustments are made before final testing.	С	
FL	F0622	Prime Focal Plane	201	All 16 channels out of spec.	Test Proc.	EO 9897 corrects spec.	С	
FL	F1035	Power Supply	002	Drawing error in 51619 (REV F)	Design	Drawing error. EO 2042A corrects drawing 51619.	С	
FL	F1036	Power Supply	002	Component not installed per print	Assy/ Fab error	Instructed operator to follow component orientation as indicated on drawing and specificate	C Lon.	ORIGINA OF POO
FL	F1302	SMA		Terminals E5,E1,E4,E8, are not marked as per drawing 3568902	Workman- ship	Technicians instructed to use caution when using terminals.	С	ORIGINAL PAGE IS
FL	F1305	SMA	5	Improper Cleaning by Vendor	No Failure	Vendor error. SCAR 63891 sent to vendor.	, с	
FL	F1306	SMA	007	Drawing was not clear	Design	Dwg. error ECR 873583 corrects drawing 3568985.	С	
FL	F1307	SMA		Harness continuity failure	Work- manship	Assembler cautioned to use extreme care when performing the wiring operation.	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	
FL	F1308	SMA	008	Part was installed back ward during assembly.	- Assy/Fab error	Assembler cautioned to use extreme care	_ c	
FL	F1322	SMA	005	BRDF testing showed on average total integrate scatter of 0.5%	Test d Procedure	EO 64392 corrects drawing 3568899	С	
FL	F1325	SMA	004	DAS internal component failure	Test Equipment	HS 236-7830 directs that DAS be red tagged to flag discrepancy and assure repair prior to next use.	С	
FL	F1327	SMA	004	Frame to data station fixture shim out of spec.	Test Procedure	ECR 864797 correct proble	m C	
γL	F1328	SMA	004	TFE S,L,N,SME2; Rev. 2 Rev Scan out of spec	Test Procedure	Test personnel cautioned about sensitivity of shim ECR 864799 clarifies shim	C s.	OR OF
FL	F1329	SMA	004	Cross Scan RMS exceeded Spec.	Test Equip- ment	procedure. ECR 864796 and EO 13111 corrects test procedure 32015-1004	С	ORIGINAL F
FL	F1330	SMA	004	Unit level out of spec.	Test Procedure	W-121 corrects problem	С	PAGE IS QUALITY
FL	F1342	SMA	004	Improper use of assy. tooling.	Assy/Fab error	Assembly personnel instructed in proper use of Assy. tooling.	С	≺ <i>(</i> 3
FL	F1352	SMA	005	Inadequate polishing	Workman- ship	Scattering tests to be performed prior to mirror Acceptance from vendor.	с •	
FL	F1353	SMA	005	When "scotch clad" stripable protective coating per HMS 16-1768 was stripped from front mirror surface coating	Cause unknown	Vendor error SCAR 63891 sent to vendor	С	

was damaged.

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Ac		Status Open/Closed	5
FL	F1439	Power Supply	003	At initial application of voltage, input current was approachin limit set by TS 16518.	error	Instructed ope to follow comp orientation as on drawing.	ponent	С	
FL	F1666	Electronic Module	401	All channels on band 3 failed to meet transient frequency response req.	test set up	GAS Flow (N2) FPA.	increased on	С	
FL	F1667	Harness Assembly	101	Adjusted model 2005 voltage ref. to -1 500V, output was: +5.628V and should be 0.00 + 0.3V.	Assy/ Fab error	Personnel cause review dwgs as make sure hard correct.	nd EO to	С	
FL	F1668	Electronic Module	101	Mean resistance of values determined in 4.3.2. and 4.3.3 not within spec.	Assy/ Fab error	Technicians had been cautioned extreme care to components.	i to use	C	ORIGINAL OF POOR
FL	F1669	Relay Optics	003	Left bank LVDT does not reverse right bank does not respond.	Work- manship	Technicians ar personnel instuse greater caassy and inspendence.	ructed to	С	IAL PAGE IS
F <b>L</b>	F1717	Prime Pocal Plane	103	Requirements of Para. 4.6 (frequency response) and para. 4.7 (wide band noise) are out of tolerance in 8 places.	Work- manship	Design and too changed to rec substrates due	luced stress	Ln .	
FL	F1742	Telescope Assy.	001	Discoloration (reddish hue) observed on mirror surface.	Cancelled	MRB for dispos 280985	sition NCMR	.c	
FL	F1744	Relay Optics	201	Transformer (T1) measures open at secondary circuit.	Unknown	Parts now sent for disposition	-	С	
FL	F1747 Spare	Relay Onrice		Units would not meet spec (16072) holding	Design	Inchworm trans stored in drv		ow C	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Descripti	Lon Cause	Corrective Ac	tion	Status Open/Closed	6
FL	F1748 Spare	Relay Optics		Unit would not meet spec. (16072)	Test equip.	Tooling to be to prevent da future units.	mage on	c	
FL	F1761	Prime Focal Plane	101	Offset limits out of spec. on eleven channels	Mfg. procedure	FL PostAmp bo 5094-1A) was PF due to sch ations. Sele PWB had to be be compatible	used for edulc conside cts for curre redetermined	ent i to	
	See Page		_	-		_			
FL	F1769	Electronic Module	201	Ch. 7 single ended output linearity defect.	Defective part	Due to tolere Hybrid had to		С	
FL	F1774	Electronic Module	201	All 16 channels exceed max. gain of 20 DB for max. boost above the 100Hz gain.	Tes <b>t</b> Procedure	EO 9897 chang and item is w		nts C	ORIGINAL OF POOR
FL	F1776	Electronic Module	201	All 16 channels exceed max gain of 20DB for max boost above the 100 HZ gain.	Test Procedure	EO 9897 chang and item is w		nts C	NE QUALITY
FL	F1781	Electronic Module	102	Pins 2,6 and 10 on U35 shorted together.	Assy/ Fab error	Parts disposi MRB ref NCMR		С	
FL	F1783	Electronic Module	102	No clock input to U8 (pint) and U7 (Pin 1)	Design	EO 9902 corre	cts design	С	
FL	F2240	Prime Focal Plane	102	Channels 7 and 1 wide band noise exceeds limit of 2.4 PA is approximately 3.5 PA.	Workman- ship	Band level As redesigned an cautioned to care during A	d operator use greater	C on,	

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Model Level	FR 	Unit Name	Unit S/N	Symptom/Description	Cause		tatus pen/Close	d
FL	F2241	Prime Focal Plane	203	Channels 1,2,8 wide- band noise exceeds limits of 2.4 PA.	Workmanship	Band Level (Assy. redesigned and oper. cautioned to use greater care during assy. operation.)	С	
FL	F2387	Cold Focal Plane	201	Band 5 Ch 13 offset. No response to INI frequency.	Mfg. procedure	Improved static discharge precautions initiated.	С	
FL	F2662	Prime Focal Plane	208	Channel 8 noise out of spec.	Test equipment	The "est detector should have been changed. Personn have been instructed to do so in the future.	C el	
FL	F2663	Prime Focal Plane	203	Ch. 7 transient response is out of spec.	Defective part	Replaced resistor for channel 7.	С	
FL	F2664	Cold Focal Plane	201	Band 7 had 0.0 drain current and signal Ref. channels have the same voltage for all channels.	Test equipment	Defective meter replaced.  Precautions initiated.	C	ORIGINAL PAGE IS OF POOR QUALITY
FL	F2665	Cold Focal Plane Assy.	201	Response output voltage out of spec.	Defective part	Defective detector replaced	. C	PAGE IS
FL	F2666	Prime Focal Plane	208	Noise from channel 6 out of spec.	Unknown	Defective FET and associate substrate were replaced.		
FL	F2667	Cold Focal Plane	201	No signal out of Band 5 Ch 3&8	Mfg. procedure	Improved static discharge	c	
FL	F <sup>2</sup> 568	Prime Focal Plane	401	Large amount of crosstalk observed on channels 14 and	Workmanship	Operator cautioned to use more care.	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause		Status Open/Closed	
FL	F2669	Prime Focal Plane	207-1	Ch 3 transient resp. is 1.25% @ bou sec $S/B \le 1$ % @ 60, $\mu$ sec.	Design	Design problem unit accepted per W-119.	С	
FL	F2722	Electronic Module	201	Observed improper waveform during test 16238 para. 3.3.4.	Workmanship	Operator instructed to use greater care when performing rework.	C ng	
FL	F2723	Electronic Module	201	Observed improper current peak amplitude,	Mig. Procedure	Planner instructed to use greater care and assure he has all applicable EO's, incorporated into his planning.	С	
FL	F2724	Electronic Module	201	Phase offset unable co add properly.	Workmanship	Operator and inspector instructed to review plann more carefully to assure they read all supplements.		
FL	F2808	Multiplexer	15	Channels 11&12 shorted together	Workmanship	Operator cautioned to use more care in future.	С	
FL	F2812	Multiplexer	17	Channel 4 DC restore, DC level changes.	Defective parts	Replaced hydrid:	С	
FL	F2813	Multiplexer	16	Channels 9-17 no output	Defective parts	Replaced hydrid.	С	
FL	F2814	Multiplexer	003	Rl(MXll) overheating	Assv/FAB Error	Operator cautioned to use greater care.	С	ORIG OF -
FL	F2815	Multiplexer	003	B34 of connector is connected to U24-8 (MX11)	Wiring error	Operator cautioned to use greater care in assembly.	С	ORIGINAL PA
FL	F2816	Multiplexer	14	Channel 9 buffer has excessive gain.	Defective parts	Replaced Hydrid,	С	PAGE IS
FL	F2817	Multiplexer	CO3	Conv. MSB output (52) has excessive fall time.	Test Procedure	Test operator instructed to ensure selection components are temp. installed before test begin	•	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	9
FL	F2818	Multiplexer	003	Band Sel Bit 1 (C34) wave form incorrect.	Wiring error	Operator instructed to use greater care when performing rework.	С	
FL	F2819	Multiplexer	003	Minor Frame sync. signal (C29) improper.	Workmanship	Operator and inspector cautioned to use greater care in future.	С	
FL	F2820	Multiplexer	003	Ret on (ClO) timing incorrect (MXO8).	Assy/Fab error	Operator and inspector cautioned to use greater care in future.	c ·	
FL	F2821	Multiplexer	003	Excessive common mode noise on buffer output ch.B.	Defec <b>tive</b> parts	Replaced hydrid	С	
FL	F2822	Mutliplexer	13 to 18	Rail voltage "B" test reads in excess of specs tolerance.	Test procedure	TP3569224/SCN 1 Test Procedure modified to re- lax limits.	. с	ORIGIN OF PO
FL	F2823	Multiplexer	14 to 18	Rail voltage "A" test point reads lower of spec.	Test procedure	Test Procedure modified to relax limits.	С	RIGINAL PAGE IS
FL	F2824	Multiplexer	13,14	Rail voltage "A" test point reads in excess of spec.	Test procedure	Test Procedure modified to relax limits.	С	ALI'
FL	F2825	Multiplexer	16	Sensor 2 input buffer has excessive droop in DC restore mode.	No tailure	Passes higher assy. which tigher requirements.	n has C	
FL	F3557	Mutliplexer	003	J6 (back-up NRZ) output only .25 "P-P looking differentially across J6 pin 1 and 2	Defective parts	Defective IC replaced.	С	
ĕL	F3660	Mutliplexer	003	Band 1 sensor 8 fails DC response test.	Test set-up	Operator instructed to use greater care when mating connectors.	C.	

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Model Level	FR Ø	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	
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FL	г3864	Power Supply	002	Incorrect lead indexing observed on redundant relay K-3.	Assy/ Fab error	Instructed operator to follow component orientation as indicated on drawing.	С	
FL	F3865	Power Supply	004	During Eng. evaluation side using an external pulse generator, mini-inverter failed in high input current mode. Smoke was observed.	Test setup	No further requirement to use an external pulse generator on this or any other Power Supply.	C	
FL	F3866	Power Supply	004	Unit demonstrated greater than 375 watts input during pre-vib, short form test.	Test Proce- dure	Remove maximum input Power requirement per SCN -3 to ts. spec. 16603.	c <u>c</u>	<b>Q</b>
FL	F3867	Power Supply	004	Unit failed post vibration short form test.	Def- ective parts	Replace all 908307-2 relays in Flight Supply with Relays tested to CDU-0702.	E POOR QU	ORIGINAL PA
FI	F4253	mutliplexer	003	Band 1 sensor 7 fails no thres- hold test.	Test equip- ment	Relay replaced and successful retest conducted.	JALITY	PAGE IS
FL	F4254	Multiplexer	003	Numerous X talk errors.	Desiga	Hardware was accepted per W-124.	C	
FL	F4255	Multiplexer	003	Band 1 sensor 13 and Band 5 sensor 6 fails input buffer droop test	Design	Hardware was accepted per W-124.	С	
FL	F4256	Mutliplexer	003	Band 1 sensor 7 failed input buffer A/C	Test equir_	Relay replaced and successful retest.	C	

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Modei Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Clos	ed
FL	F4257	Multiplexer	003	Numerous X talk failures.	Design	Hardware was accepted per W-124.	С	
rL	F4265	Multiplexer	003	Band 6 sensor fails A/D conversing test	Design	Hardware was accepted per W-124.	С	
FL	F4266	Multiplexer	003	Band 1 sensor 1 and Band 6 sensor failed A/D thres- hold test.	Design	Hardware was accepted per W-124.	С	
FL	F4267	Multiplexer	003	Band 6 sensor 1 failed A/D threshold test	Design	Hardware was accepted per W-124.	С	
FL	F4268	Multiplexer	003	Numerous crosstalk failures,	Design	Hardware was accepted per W-124.	С	OF OF
FL	F4831	Power Supply	004	Center tap current in mini primary winding of XFMR indicates 1 amp of pulsed current.	Wiring error	Operator and wire checker instructed to physically trace wire to termination point.	c	ORIGINAL PA
rL	F4832	Power Supply	002	Sync, pulse not observed on MAXI-BRD,	Wiring error	Instructed assembler and wire check inspector to follow wire to termina	C É	PAGE IS
FL	F4833	Power Su <sub>L</sub> ply	002	During attempt to phase up pulse width on maxi-PWB no load condition.	Test- set-up	Instructed technician to have second technician verify test set-up before voltage applied.		
FL	F4834	Power Supply	004	Center tap current in the maxi is exceeding 15 amps with no load on maxi redundant.	Work- man- ship	Operator instructed to follow normal workmanship standards to avoid hazardous wire routing.	C	
FL	F4835	Power Supply	002	Try to turn maxi up but it only turns "on" a little.	Assy/ Fab Error	Assembler and inspector instructed to follow drawing carefully and verify correct part.	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Clos	sed	
FL	F4836	Power Supply	004	While unit was operating at 35V bus in outgas mode it shut off after about four minutes and could not be commanded on.	Design	E02046A correct problem.	С		
FL	F4837	Power Sumply	004	When sync was turned "on", unit would not sync.	Rough Handling	Responsible mfg. supervisor has been informed by the REA as to the proper work- manship methods to use.	С		
FL	F7295	Multiplexer	003	Band 2 sensors 4 and 13 failed crosstalk.	Design	Hardware was accepted per W-124.	С	ORI OF	
FL	F7296	Multiplexer	003	Band 1 sensors 10 and 14. Band 2 sensors 4 and 14 failed cross talk.	Design	Hardware was accepted per W-124.	С	ORIGINAL PAG	
FL	F7299	Multiplexer	003	Band 2 sensors 4,5 and 14 fail X talk.	Design	Hardware was accepted per W-124.	С	PAGE IS	
FL	S8014	Electronic Module	201	Jumpers not to print		Personnel cautioned y/to use extreme care when installing jumper wires.	С		
FL	\$8018	CFPA	201	Feedback loop Band 5 ch 13 measured open circuit when tested per supplement 1 ope. 1300 step 3.	Work- man- ship	Operator was cautioned to use more care in applying and cleaning up epoxy.	С		
FL	S8049	Electronic Module	201	Observed improper waveform during test.	Test set- up	Technicians cautioned to check test set-up prior to test.	С		

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Model Tevel	FR {/	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Clos	ed
FL	\$8050	Electronic Module	201	Observed improper linearity data over temperature per spec.	Defec∸ tive parts	Defective part re- placed. PB informed of problem.	С	
FL	\$8051	Electronics Module	3 201	Phase Ramp; unable to adjust correctly	Mig. Proc./ Assy/ Fab	Operator instructed to use greater care to insure ' proper install— ation of value parts.	C	
FL	S8058	Prime Focal Plane	102-1	Channel no. 1 output pegged at -25 VDC.	Work- man- ship	Tooling has been redesigned to prevent damage to substrate.	С	ORIG OF F
FL	S8084	Telescope Assy.	001	Sections of the inside diameter of the mirror broke during mounting of registration surface reference plate onto Primary Mirror.	Test Equip- ment	New tooling has been provided that does not clamp to primary mirror.	C	ORIGINAL PAGE IS
FL	S8101	Elec. Module and SMA	201	Partial system connected to TM Elec. Mod. Test set attempts at turning system resulted.	Test Equip- ment	Test Equipment Repaired.	c	
FL	\$8106	Radiative Cooler	003	Cooler Intermediate stage Platinum Resistance Temp. School Circuit at connector J-2 pin 29 to pin 31 shows open.		Future models will be spot bonded to strengthen solder pad area per EO 04269A.	C	
FL	\$8108	Elec- tronic Module	003	This discrepancy was transferred to S8112 because of error. Wrong pins were			С	

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odel evel	FR	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Clos	14 sed
<u>.</u>	S8117	Rad Cooler	003	Transfer to S8136 and consolidate with S8370.			С	
<b>.</b>	S8118	Rad Cooler	003	No failure test eng. misread data.			С	
L	S8125	Elec- tronic Module	003	J35 Pin F4 (signal ground Band 1 ch 10) open	Test set- up	Test technicians have been alerted to check mating of connectors more thoroughly.	c	
L	S8126	Electronic Module	003	J30 Pin K4 (signal ground band 1 ch 15) open	Test set- up	Test technicans have been alerted to check mating of connectors more thoroughly.	С	
L	S8134	Thematic Mapper	003	SMA heater and sunshade sensor cable harness impedance measurement at P28 Pin 1 to Pin 5 is open S/B 31 $\Omega$ , Pin 34 to Pin 36 is 13.9 $\Omega$ S/b 25 $\Omega$ .	Wiring error	Assembly technicians have been instructed to use proper test equipment.	С	ORIGINAL PAGE IS
L	S8140	Thematic Mapper		SMA +6.8V Power Supply #2 telemetry read OV when Power Supply #2 was turned on.	Test set- up	Test technicians were cautioned to review test equipment configuration more carefully, especially switch positions, prior to filing Failure Reports.	С	
FL	S8201	Prime Focal Plane	401	Diagnostic testing revealed that ground plane on even channel half band substrate (S/N 102-1) was not connected to signal return.	Unknown	Cross talk for channel 2 acceptable per Waiver W-123.	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed
FL		Prime Focal Plane	201	Ch 6 wide band noise out of spec.	Unknown	Replaced Ch 6 FETS and adjusted crosstalk are within spec pretest data.	С
FL	S8205	Optical Assy.	201	During recheck of select rsistors and capacitors found ch #3 Band 5 to have oscillations.	Work- man- ship	Nonrequired. Infrequently there are small differences in capacitors between having parts during selection and after part has been soldered to the basis.	C
FL		Prime Focal Plane	212	J1-16 to J1-1, J1-5, J1-23 out of spec.	Test equip- ment	Defected test lead was replaced.	c 9.9
FL	S8207	CFPA	201	No output Band 7 Ch 7	Work- man- ship	Personnel instructed as to proper installation at PWB in housing.	<b>≈ 1</b> 1 × 11 × 11 × 11 × 11 × 11 × 11 × 11
FL	S8208	CFPA	201	Band 5 out of spec.	Design	Hardware accepted per W-135.	PAGE IS QUALITY
FL	S8225	CFPA	201	Band 5 Ch 9 input short to ground, Ch 11 no out put signal.	Work- man- ship	The arrays were destroyed during removal from FPA and no further analysis was possible.	c ~ w
FL	S8226	CFPA	201	Band 5, Ch.10, 12 difference between signal and Ref. off- set measured > + 10 MV.	Un- known	Repaired with Ag epoxy per MRCO 393239.	С
FL	S8227	Electronic Module	201	Ch 4 failed to meet the pre-gain resistor (R90) selection re-quirements without using a component outside the select	Test proce- dure	EO 3442A increases select range.	c

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Model Level	FR	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Clo	16 sed
FL	S8228 Spare		210	Channel 7 out of spec.	Unknown	Tooling has been modified with insulating tape to prevent static damage.	c	
FL	S8230	CFPA	201	Band 7 even detectors all have low output at 10HZ.	Mfg. proce- dure	Replaced detector	C	
FL	S8283	Electronic Module	201	Ch 13 failed to meet pre-gain resistor (R87) selection re-quirement without using an out-of-selection component.	Test procedur	EO 3442A broadens re select range.	C	ORIGIN OF PO
FL	\$8309	Electronic Module	201	Solder bridge between traces to U31 Pin 7 and U31 Pin 8.	Work- man- ship	Inspection personnel instructed to use greater care when inspecting solder operations.	C	ORIGINAL PAGE IS
FL	\$8310	Electronic Module	201	TS16234 Para. 3.3.2.2 No -12V output.	Work- man- ship	Assembly Technician has been cautioned to review orientation device prior to solder.	C	
FL	S8311	Electronic Module	202	Test PGM T12 records 5 failures in 2 (10 <sup>6</sup> ) cycles at 50 <sup>o</sup> C.	Unknown	U17 (shift register) replaced.	C	
FL	S8312	Electronic Module	201	Test PGM 8 fails word F output - RD7	Assy/ Fab error	Mfg. and Quality personnel have been cautioned to use more care.	C	
FL	S8313	Electronic Module	201	Failed para. 3.3.2.3 SBRC 12634 (AR-5) have excessive offset.	Work- man- ship	MFG and inspection personnel instructed to review drawings more carefully.	C	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Des	cription	Cause	Corrective Action	Status Open/Clos	ed
FL	S8314	Electronic Module	201	Fails to de proper sign at U3-6 due bad solder nection at	al to con-	Assy/ Fab error	The responsible inspector has been notified and cautione to exercise more care		
FL	S8315	Electronic Module	201	The all lam on LED fail turn on at proper time in the CALL lamp seq.	ed to the	Assy/ Fab/ error	Inspection personnel instructed to use more care when inspecting parts prior to shipment.	C e	
FL	\$8316	Electronic Module	102	'Crosstalk' 2-8 to AR 2		No failure	FR open in error.	С	22
FL	S8317	Prime Focal Plane	201	Channel 4 noise is 2. PA; channel noise is 2.	. 9	Un- known	Hardware accepted per W-116.	С	ORIGINAL PA
FL	S8318	Prime Focal Plane	401	Ch's 1,5,9, exhibit out spec transi frequency rand high.	of ent/	Unknown	Hardware accepted per W-123.	С	PAGE IS QUALITY
FL	S8319	CFPA	101	Ch.10 exhib no response injected si ch. 12	to	Work- man- ship	Assy. personnel instructed to use greater care when doing rework with epoxy.	С	
FL	S8320	Elec- tronic Module -	201	Output low Channel 11 (Hybrid U4) short circu (~8 ohms) t signal grou	ited	Work- man- ship	Mfg. personnel have been cautioned to use greater care when solder component.	C s.	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed
FL	S8321	Electronic Module	201	AT S2KHZ Frequency response was: 2.24 db (should be -2.50 to -3.01) ch 6 only	Workman- ship	Hardware accepted per W-120, Oper. cautioned to use greater care.	c
FL	S8322	Prime Focal Plane	201	Ch. 5,13,14,15 and 16 exceeds transient response.	Work- man- ship	Hardware accepted per W117, Oper. cautioned to use greater care in assembly.	С
FL	S8323	Prime Focal Plane	201	No continuity between J2-16 and J2-10 on evenside of preamp Assy.	Assy/ Fab/ Error	Test procedure had been changed to check continuity between all grounds Ret. Pins.	c <b>Q</b>
FL	S8324	Prime Focal Plane	401	Ch's 1,5,9 and 13 Frequency Response out of spec.	Work- man- ship	W-115 accepts hardware. Oper. cautioned to use more care when performing Assembly operations.	OF POOR QUALITY
FL	S8325	Electronics Module	201	Ch's 1,7,8,13, 15 DC offset out of spec.	Test Pro- cedure	ECR #TM 2512/01R1 corrects TS 16597.	c 77
FL	\$8326	Electronics Modula	201	Ch 6,8 out of spec.	Test Pro- cedure	ECR #TM 2512/01R1 corrects TS 16597	C
FL	S8327	Electronics Module	201	Ch 5,8,12,13 out of spec	Test Pro- cedure	ECR #TM 2512/01R1 corrects TS 16597.	C
FL	S8328 Spare	Cold Focal Plane	301	Pins 15,16 show 16.6 $\Omega$ and .5 $\Omega$ shorts respectively - should be open.	Test Equip- ment	Text Box was rewired per switch legend. Drawing #77514.	С
FL	S8329	Electronics Module	201	Ch's. 1,7,8 out of spec. on offset	Test Proce-	ECR #TM 2512/01R1 corrects TS 16597.	C

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closec	19
FL	\$8340	CFPA	201	Band 7, Ch 8 &	Unknown	Wirebond puller	С	
		••••	-0-	16 unable to set bias adjust per 16192 para 4.10.	<b>0</b>	was at fault. Wire bond puller has been repaired to prevent static discharge.	•	
FL	\$8341	Electronic Module	101	Resistors R72 and R88 are reversed.	Work- man- ship	Personnel advised to use care when removing and reinstalling components.	C	
FL	S8342	Prime Focal Plane	201	Band 4,ch.16 wide band noise is 2,8, PA should be < 2.4 pA.	Unknown	Hardware accepted per W-118.	c	
FL	S8343	Electronic Module	201	SMA voltages out of spec.	Test Proce- dure	EO 4180A and 4199A correct 16704.	C	ORIG OF 1
FL	\$8361	Aft Optics Assembly	003	Shutter natural period has changed is presently out of spec.	Mfg. proce- dure	Planning changed on AHR	С	ORIGINAL PAGE IS
FL	S8362	Aft Optics Assembly	003	Shutter natural period has changed is presently out of spec.	Work- man- ship	Operator cautioned to use more care.	C	7
FL	S8363	Electronic Module	201	Channels R&1 thru R96 out of spec.	Test Proce- dure	E04059A corrects TP 16704.	С	
FL	S8364	Electronic Module	201	When main shutter on (CMD13) issued. The redundant shutter driver was not commanded off.	Assy/ Fab error	Mfg. Eng. supervisor informed of the error and has agreed to exercise greater care during future planning operations.	C	

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Model Level	FR #	Unit Name	Unit S/N	Sumpton /D	ogovintion	Cougo	Commontino	Aordon	Status	20
rever	1/	OHIL Name	OHIL SIN	3ymp com/u	escription	Cause	Corrective	ACCION	Open/Closed	
FL	S8365	Electronic Module	201	Kleeburger 9,10	r, Chs 1,	Work- man- ship	Assembly teccautioned to all wirings connections	check and	С	
FL	\$8367	Electronic Module	201	Shutter to stops on t at 0°C Ref per 139.5	urn on	Work- man- ship	Test personn to be more c selecting re values.		С	
FL	S8368	Elect.onic Module	101	J-24-5 to read appro L6m with like a cap leading D	ox. slowcharge acitor	Torn In- sul- ation	Unable to de cause of tor	termine n insulation.	C	ORIG OF F
FL	S8370	CFPA	202	FR transfe FR 8136 ar solidate w	-	Can- celled				ORIGINAL PAGE IS
FL	S8371	Relay Optics	?	Inchworm wrespond to command.		Test Equip- ment	Wearsaver in red tagged a be used unti inspected.		C	GE IS
FL	S8378	Aft Optics Assy.	003	Resistance measurement per spec. were too he in some ca	nts 17068 nigh	Mfg. Proc <b>e-</b> dure	Inspect, per been instruct assure torque adjusted for ance prior toperations.	ted to e has been drag allow-	С	
FL	\$8384	Electronic Module	201.	Redundant Thase Lock metry word 6 reads in "Hi" when dundant sh function in manded off "of")	c Tele- i G Bit ncorrectly the re- nutter is com-	Assy/ Fab Error	Supervisor, and inspecto to use more	rs cautioned	C	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Des	cription	Cause	Corrective Act	ion	Status Open/Closed	21
FL	S8387	Aft Optics Bulkhead	003	All lOK the readings do agree with	not	Test Procedu	EO 4146A corre	ects TP	С	
FL	S8390	Electronic Module	201	SMA + 28V or spec.	ut of	Test Procedu	EO 4159A corre re TP 16704	ects	С	
FL	S8392	SMA	003	Power to SM applied, per 32015-301; did not oper	r TP SMA	Design	EO 4160 correctest set design problem.		С	
FL	S8394	CFPA	201	Electrical abetween FPW and radiation cooler structure.	cables ve	Design	E04173 correct erance built u between FPW ca shields and co structure.	ip ible	С	
FL	S8395	TM		Attempt was to bring TM full mode the FSI appeared go into full current.	up to he TM d to	Test Set UP	Test personnel cautioned to u care when work test equipment they leave test in proper confafter complete shooting.	se extreme sing with and assure at equipment figuration		ORIGINAL OF POOR
FL FL		See Page 30 Electronic Module	201	Ch. 5 R83 is	s out	Work- man- ship	Mfg, personnel to use greater removing and relect resistor	care when einstating	C	PAGE IS QUALITY
FL	\$8438	Cold FPA	201	Band 5, ch's and 12 exhibe excessively out put durinjected signess.	oit high ing	Work- man- ship	Operator to us greater care w epoxy repairs.	hen making	C	
FL	S8439 Spare	Cold FPA	401	Pin 3 and Podo not meet		Work- man- ship	Operator cauti to use more ca trimming of ca	re in	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Desc	ription	Cause	Corrective A	ction	Stacus Open/Clos	22 sed
FL	\$8440	Cold FPA	401	Chs 1,2,4,5, 11,13, out of spec. for tr response; ch 4,5,6,7,8,10 14,16 out of frequency sp	of cansient n's ),12,	Defect- ive Parts	Waiver W-123 of this assy		С	
FL	S8443	CFPA	201	Band 5, ch. out of spec.		Test Equip.	Wire bond pu found to be Pull tester		C	
FL	S8 <sup>4</sup> 46	Electronic Module	201	Channel 8 pe	eggeđ	Work- man- ship	Inspection p have been in use greater	structed to	C	
FL	S8447	Electronic Module	401	Ch's 2,3,4,5 7,8,10,11,12 15, and 16 f to meet spec	2,14, Fail	Test set- up		p. Personnel to use greater specting	С	ORIGINAL OF POOR
FL	S8456	Electronic Module	201	Word G faile once during cycling A+0 <sup>c</sup>	data	Work- man- ship	Insp. person structed to care when in solder opera	use greater specting	С	R QUALITY
FL	S8460	Electronic Module	?	Signal was i at Pins 177, 176,179,180, 174	178,175,	Assy/ Fab error	Mfg & Insp. instructed t drawings wit care to assu proper insta of component	o review h greater re llation	С	- 3-
FL	S8469	RAD Cooler	003	Excess 60 Hz on band 5&7		Test set-up	Test personn instructed in techniques to in grounding circuitry.	n proper to be employed	С	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed
FL	F0170	SMA	5	Signal Return shorted	Workmans	ship Tech. cautioned to greater care in the	
FL	F3658	Multiplexe	er 19	Fails skps 128-131. Threshold doesn't change. All other skips okay.		& utilization of he	
FL	F3868	Power Supply	004	Unit failed Thermal cycle performance test.		•	0
FL	F4252	Multi- plexer	19	No A/O conversion			0
FL	F5771	TM		Band/Channel 9 is dead. Band 4 odd channels have coherent noise which is observable on video display.	Test Set- Up	Coherent noise problem was due to coupling between unused LED's and Band 4. This condition was corrected by grounding unused LED's.	C
FL	F5772	Rad. Cooler Assy.	003	Bands, DET 9 Video signal appears inverted at SIU.	Test Set- Up	Test equip.cable had tw reversed. If this were prior to two hours afte no Failure Report would	discovered r test initiation
FL	\$8102	Elect. Mod. & SMA	201 '	Using redundant Power Supply w/partial mode loads (8.3 Amps AVg) after 2 hours operation @ 28 VDC input. A shutdown and subsequent restart occurred.			ORIGINAL PA OF POOR QU
FL	S810/	Elect. Module	003	J24 Pins 5&6 +1-20V return reads .66 ohms to chassis ground.	Design	ECA 272 2/01 lengthens sleeving and hat covers screws.	PAGE IS QUALITY

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause		atus en/Closed		7
FL	S8109	Electronic Module	003	Pin Pl on JlO and Jl3 should read approx7 ohms between them. They read open.	Test Set Up	Configuration not appropriate for test. Engineers are cognizant of the problem and will review set up more carefully.	С		
						•			
FL	\$8110	Electronic Module	003	Pin 14 on J26 chould read 1 ohm max. and it reads 38.7K ohms.	Defec- tive parts	ECA 2722101 will standarize mounting procedure and will prevent similar discrepancies.	C		
FL	S81J2	Electronic Module	003	J24 Pins 11,12, 29,30,31,32 read 86.35K ohms to chassis ground and should read > 10 mag ohms.	Unknown	ECA 2722 will standize this mounting procedure and will prevent future occurence.	C	ORI OF	
FL	S8116	SM Elec- tronics	003	Chassis ground shorted to unipoint -P26 Pins 13 and 14 reads. 4.5 ohms to chassis ground.	Work- man- ship	Supervisor was instructed to inspect for this condition and stagger shield termination		ORIGINAL PAGE IS	:
FL	\$8124	Rad Cooler Assy	201	Cold Stage heater does not control.  Power remains applied to heater regardless of PRT resistance no +1-20 On +1 -18V on output of cable W5061 and safehold heater 1 was 11.3V instead of 28.V J24 filter started getting warm. Kepco drew	Test Set- up	Eng. was cautioned to review test set-up prior to application of power.	C	78	

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Model Level	FR #	Unit Name	Unit S/N	Symptom/Desc	ription	Cause	Corrective Ac	Stat State Open	us /Closed	
FL	S8128	Electronic Module		Zero degree to (Q5 Q0 tu around) shou 5.30 +/50 and it read m.sec.	rn- ld be sec.			0		
FL	S8129	Prime Focal Plane		Zero degree Q5 (Q5 Q0 tu around) shou +/50 sec read 7.8 m s	rn- ld be 5.30 and it			. 0		
FL	S8130	Prime Focal Plane		Cal Lamp 2 i 109.4 mas an draw 108 mas Lamp 3 is dr 110.1 mrs an should draw	d should and Cal awing dit	Test Set- Up	ECR 972732 wi	11 update	С	ORIGINAL OF POOR
FL	S8131	TM		One bit is n properly whe telemetry in stream.	n putting	g Test Equip- ment	No failure, to personnel information trouble shoot Equipment before	formed to	с •	PAGE IS QUALITY
FL .	S8133	Elec. Module		After fusible switches have closed and 2 are read on (which is okthen all switchen at 16 remains and to zero (3 mm.)	e been .3 volts test box ) and tches are to 20 volt slowly decre		just prior to	leads together connection to r test zeroed roduced acceptable	C	
FL	\$8136	Rad Cooler Assy	003	Band 5 ch 9, 1.17mV 1.44m wide band no is approx. 2 oscillation popcorn nois	V, 0.605mV ise. Noise 00 KHz with			0		

Model Level	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	
FL	\$8139	Electronic Module	202	Control temp, voltage out of spec.	Test Procedur	EO 4365A changes e tolerances so that previous readings are now within spec.	С	
FL	\$8143	Rad Cooler Door Assy	003	Motor when electrically activated will not move door open or closed.	Assy. Fab./ Error	Removed motor 51258 S/N 0 Installed motor 51258 S/N 16912. Vendor will take prevent similar problems	001.Retested precautions to	•
FL	\$8180	Electronic Module	202	"Temp Error" voltage out of tolerance.	Test Pro- cedure	EO 4366A changes tolerance so that previous readings are now within spec.	es C	
FL	S8209	Cold Focal Plane	301	Band 7 ch. 6 feed- back cap appears shorted - does not respond by rolling off at high frequencies.	Work- man- ship	Technicians were cautione to use extreme care.	d C	ORIGINAL OF POOR
FL		Prime Focal Plane	501	Ch 15 no response DC offset is adjust-able, high noise with 1/f noise evident.	Unknown	Waiver W-154 will correct problem.	c	PAGE IS
FL		Prime Focal Plane	501	Ch 1,5,7,15 out of spec. Ch 9,13 out of spec.	Work- man- ship	Waiver W-155 will correct problem.	С	
FL	S8218 Spare	Cold Focal Plane	301	Drain currents for bands 5&7 out of spec.				
FL	S8229	Prime Focal Plane	212-1	Channels 1&2 exhibit excessive noise after repeated changes of FETS.			0	•

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Model Level	FR #	Unit Name	Unit S/N	Symptom/De	scription	Cause	Corrective A	ction	Status Open/Close	27 d
FL	S8231	Prime Focal Plane	211-1	Ch. 1 fail transient requiremen	response	Design	Waiver W-157 correct prob		С	
FL	S8372	Electronic Module		Redundant would not lock.					0	
FL	S8401	Prime Focal Plane	101-1	Frequency is +.6dB a should be -0.9 dB	t 20 KHZ	Design	Waiver W-158 correct prob		С	
FL	\$8461	Cold Focal Plane	301	Band 7, ch shows 10 M short to g at Fet Gat	ohm round	Work- man- ship	Assembly Tec were caution for this typ crepancy dur manufacturin operations.	ed to check e of dis- ing	С	original Of Poor
FL	S8369	Scan Mirror Assy.	004	Looking in SMA P2 M b out box, p reads 84K chassis w/ J2/SAM P1 mated.	reak- in 13 Ω to SME	Test set- up	No Failure - were found d trouble-shoo operations.	uring	С	IAL PAGE IS
FL	S8127	TM	• тм			Work- man- ship	Caused by Fa stall insert The technici advised of t and cautione reoccurrence	in cable co ans have bee his discrepa d to prevent	onnector. en uncy : a	

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Model Level	FR #	Unit Name	Unit S/N	. Symptom/Description	Cause	Corrective	Action	Status Open/Clos	28 ed
FL	S8213 Spare	CFPA	301	Band 7 Ch 7+15 out of Sp	ec.			0	
FL	F5774	TM	003	IFOU sizes too large and response to line source 2 IFOU's from center of detector exceeds 1%.	I			0	
FL	F5776	ТМ	003	Bands 1 and 2 show secondary peaks in sensitivity well away from the nominal channel centers. (Larges second peak in Band 1 De 1 about 10% of peak sign + 13 IFOU's away).	t.		•	0	
FL Spare	S8219	Cold Focal Plane	301	Band 7 Ch 10 no response injected signal @ all frequency.	to Desi	shield a	crosstalk and insulated er 4464A.	С	00
FL	F5777	TM	003	Bands 5&7 are 26.25 IFOU apart spec. is 26.0 ± .2 IFOU's (This FR is a result of Post-Test Examtion of test data).				0	ORIGINAL PAGE IS
FL	F5778	TM 51065	003	Band 1 videosignals from detectors 8,10,11,14&16 large offsets. (Band 4,D 16 has same problem) in dark vidver collects.	shows ET				ב ופ
FL	F5779	тм 51065	003	Band 1 'ideo exhibits un acceptable coherent nois levels.					
FL	S8464	Elec. Module 50904-1		Band 1 offsets out of sp Should be -4.00 ± 0, 200 Are Ch: 3-426U, no failur 4 -4.46,6 -4.34, 10 -717 14 - 4.23, 15 -4.55.	DC. Fai	New select r lure were in Retested suc 6-28-82		c	

during set-up for 8L07. (intermittant)

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odel evel	FR #	Unit Name	Unit S/N	Symptom/Description	Cause	Corrective Action	Status Open/Closed	
	S8167	TM	003	When the Mapper is turned on with the SME and shutter on at the same time the shutter bangs.				
•	S8168	тм	003	Lowgrain in Band 6: channel 11,28% low; channel 3, -2% low (channel 2, 9% high; channel 4, 7% high)				
	F1764	Electronic Module	201	All 16 channels exceed Max. gain of 20DB for Max Boost above the 100 Hz gain.		EO 9897 changes re re ments and item is spec.		
	S8405	Rad Cooler	201	Hi noise Ch. 8	Unknown	Hybrd replaced.		

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Mođel	FR		(Addendum	FAILURE REE for Pre-Ship	PORT ANALYSIS		·	Status	
Level	0	Unit Name	Unit S/N	Symptom/De	escription	Cause	Corrective Action	Open/Closed	
FI,	F2369	ТМ	003	During Pos SRT, LVDT inchworm m	3 indicated	No Discre- pancy	Failure Report was opened to document LVDT motion. Inchworm repositioned optics.	0	
FI.	F1787	тм	003	preamp (TI	gs for cold LM) tempera- the isolated (TLM).	Work- man- ship	Bent connector Pin was straightened and technicians caution to use care when mating/demating connectors.	C	:
FL	F2717	тм	003	is low. A 0.34 to 0 rework. I rework the	.36 after Prior to	Work- man- ship	Loosening and re- torquing of bolts combined with lapping of surface to relieve stresses, allowed successful realignment.		ORIG
TL .	F2718	TM	003	No reading baseplate at J15.	gs for TM telemetry	Un- known	Cause is unknown. W173 authorizes use as is.	c	ORIGINAL PA
i.	F2719	тм	003		nnel appears short circui	t		0	PAGE IS
FL	F5780	тм	003	of Band 5, 10 is appr of all oth detectors	ideo) output, detector rox. 50-60% her Band 5. Dise level			0	
FL	S8149	тм	003	to open from position, will require	is commanded rom closed it sporadica ire two comma f one to the	11y	Limit switch was readjusted. Technician now understand adjustme procedure.		

Model Level	FR #	Unit Name	(Addendum Unit S/N	FAILURE REPORT ANALYSIS for Pre-Shipment Review M Symptom/Description	eeting) Cause	Corrective Action	P Status Open/Closed	age 2	:
FL	S8159	114	003	MUX 1 data does not arrive at Demux.	Test Equip- ment	Replaced defective cable W4004/P8. Discrepant cable repaired.	С		
FI.	S8161	тм	003	Shutter data is dark. S/B 2 to 5 count range, is from 28 to 255 for channel 9 of Bands 3,4,5 and 7.		•	0		: :
FL	S8169	Optical Assembly	003	Resistance between mounting foot #2 and Aft Optics Bulk-head is 62.0 milliohms, S/B < 15 milliohms.	Test Set-Up	Planning has been changed to show reconnection of ground straps prior to performing resistance checks.	c	00	
FL	F2375	тм	003	Band 6, Channel 1, low signal from calibrator in gain linearity test.			0	ORIGINAL PA	
FL	F2370	TM	003	Band 6 output constant at 85 counts for all four detectors.	Drawing Error	EO 4686A corrects dwg. error.	0	PAGE IS QUALITY	

Drawing

Error

EO 4686A corrects

dwg. error.

U3 ± 15V regulator

The -15.0V output

failed to current

limit.

003

FL

F2385 TM

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#### P/N 51065

F	LIGHT	PRO	TOFLIGHT	ENGINEER			
Failur	e Report	Failu	re Report	Failure	e Report		
No			٧o.	No			
Open	Closed	Open	Closed	Open	Closed		
1 1							
i i	F2375 F1787		F0544		F0504		
F2369	F2385 F5777	· [	F0551	}	F0505		
F2370	F2718 F2717		F0573		F0508		
F2369	F5771		F1739	ł	F0510		
F2370	F5772		F1740	{	F0511		
	F5778	İ	F2636		F0513		
F5774	F5779	1	F2644		F0521		
F5776	S8101	1	F2691		F0532		
	S8107	1	F2709		F0533		
S8167	S8127		F2765		F2714		
	S8131	1	F2771		F2715		
	S8134		F2772		F2745		
1	S8158		F2773		F2747		
	S8160	}	F2774		F2748		
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# SANTA BARBARA RESEARCH CENTER A Schoolary of Hughoo Amerita Company INTERNAL MEMORANDUM

TO: D. E. Sauers

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CC: W. D. Adams

DATE: 24 June 1982

L. Altman

REF: PE 137:82

SUBJECT: Corrective Action for

Failure Report No. F5772

FROM: L. O'Connell

BLDG. B11 MAIL STA. 39

EXT. 6357

Attached is a copy of subject Failure Report and QCHR ES 67093 for your information and files.

At this time contract quantities of Thematic Mapper hardware are complete and no follow-on is anticipated. However, test equipment and cable fabrication are common to all programs and Inspection/Test personnel should be alerted to make sure applicable hardware is fabricated and wrung-out per applicable drawings and schematics.

Please inform Inspection/Test personnel under your cognizance of subject discrepancy and review your workmanship standards with them so they understand the importance of assuring that cable terminations are per print.

L. O'Connell

Reliability Manager Thematic Mapper Program

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#### SPACE AND COMMUNICATIONS GROUP

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#### SPACE AND COMMUNICATIONS GROUP

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HUGHES AIRCRAFT COMPANY
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## FAILURE REPORT CONTINUATION SHEET

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**QUALITY CONTROL HISTORY RECORD** 

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SPACE Failure report

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# ORIGINAL PAGE IS OF POOR QUALITY SPACE AND COMPUNICATIONS GROUP FAILURE REPORT

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#### REQUEST FOR INSPECTION/TEST

No.300856
L DATE OF REQUEST: 4/20/82

ISEE REVERSE SIDE FOR COMPLETION INSTRUCTION!

2 TO: _	c,c	, Benson	<del></del>	DE	ЕРТ. NO. <u>41</u>	<u>-35</u> bldg. <u>S</u>	12 RM. <u>C53</u>	15 MS <u>V329</u>	ЕХТ. 80879	5. Project/Progress Thematic Happer	
3. FROM	ն <u>L.</u>	O'Connell		0	EPT. NO. <u>51</u>	-41 BLDG. 1	1RM	_us <u>_39</u> _	EXT. 6357	6. GLA/Acct No. P264-A15110000	<u> </u>
4. AUTI	IORIZ	ED SIGNATURE:	6	12	Good	2/101				7. P.O. No.	
14. INST	PUCI	TONS.		<del></del>						6. R. R. No	<del>2</del>
			llow	lng A	cceptance	Tests per	Para. 4.3	(Table 5	of TS 32015-034	9. Stock Y/e No.	<u>ลื</u>
		<u>T</u>	able	5			545	78 J24 F	lter	10. Credit Reg. No. R	
Pinal	Per	formance Tes	t					5,2,5		11. Fork Order No.	PAG-
<u>Final</u>	Red	undant Lead	Test		·			5,2.3		12. NCMR No	ivi
Final	111-	Pot Test						5.2:4		13. Other FR 58127	
Please	e re	turn copy of	tes	dat	a sheets	and thio f	orm to L. O	'Connell	,B11/MS 39.		
IS. ITEM	16. QTY	17. PART NUMBER	IB. ACC	19. SUSP	20. DATE		STAMP/ IGNATURE	22. HOURS CHARGED	23. COMMENTS	-specify reasons for non-acceptance	<u> </u>
1	1	54578	X		4/21/82	62 Ban	N. A.			ATA ATTACHED AND ACCEPTA	BUS.
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						}		<b> </b>			

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QUALITY CONTROL HISTORY RECORD (CONTINUATION SHEET)

*ر*م.

GI A	F2	14	PART NUMBER 54578	PART SE	R NO	00	1		SHEET OF H R SER NO		
INSP	DATE	I)PN	, QUALITY HISTORY	DATE	ACC 198Y	1NSP	DATE	OPN.	U QUALITY (115TORY	DATE	ACC
- 1. J	7. l		OC INCO FILTER ALLY (MEDALINA)	1/4	74C				28		
	•		'OC INSP FICTER ASSY (INCOMING) 2 PROJECTO TEST NO DULLAGE NOTED	E					29		
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HAC			· Completed final performance	7507.2	HAC				23		$\Box$
532	22		32015-034 Rev. 1/6 Pan. 4.3	19	\$32	7			34		$\Box$
	P.B.		(table 5), Reviewel and accepted	1					ас		
			Completed final performance acceptance tests per TS 32015-034 ker. Vc. Para, 4.3 (table 5). Reviewel and accepted test data.						36		
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TS 32C15-C35 Rev. -16 November 1981

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TEST S32

J24 FILTER (54578)

APR 22 1982

10.2.2 Redundant Lead Test Data

8127

S/N: \_\_\_\_\_/·

Testing Phase: FINAL REDUNDANT LEAD

Verify with a check that the red "LED" comes on with each function below:

Para.	Switch	<u>Positions</u>	<u>Verify</u>
5.2.3.1	\$5	<b>S6</b>	
	-1	-1	(Check)
	-2	-2	✓ (Check)
	-3	-3	. / (Check)
	-3	-4	(Check)
	-3	<b>~</b> 5	(Check)
	-4	-6	(Check)
	-5	-7	(Check)
	-5	-8	(Check)
	-5	-9	✓ (Check)

Styfelbre OF

4/21/82 Date

TS 32015-034 Rev. -16 November 1981



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J24 FILTER (54578)

8127

APR 22 1982

10.2.3	Hi-pot	Test	Data

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Testing Phase: FINAL HIGH POT

REF. PARA	DESCRIPTION	LIMITS	MEASUREMENT
5.7.4.2	Resistance	Shall be >1M SZ	20MI
5.2.4.3	Resistance	Shall be >IM St	<u> 549</u>

TS 32015-034 Rev. -16 November 1981

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#### J24 FILTER (54578)

APR 22 1982

16.2.4 Capaci	tor Test Data		•
S/N:/	Temperature:	AMB	
Testing Phase:	FINAL PERFORMANCE		
REF. PARA	DESCRIPTION	LIMITS	MEASUREMENT
5.2.5.1.2	Capacitance Measurement	7 <u>+</u> 2 uF	uf
5.2.5.1.3	Capacitance Measurement	7 <u>+</u> 2 uF	uf

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4/21/82 Date

TS 32015-034 Rev. -16 November 1981



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APR 42 1962

#### J24 FILTER (54578)

10.2.5 <u>Diode</u>	Test Data		
S/N:	Temperature: _	AMB	
Testing Phase:	FINAL PERFORMANCE TO	EST	
REF. PARA.	DESCRIPTION	<u>Limits</u>	MEASUREMENT
5.2.5.2.2	Diode Voltage Drop	1.7 (+.23)	v
5.2.5.2.3	Diode Voltage Drup	1.7 (+.23)¥	V

Astropellich 68 dester(s)

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TS 32015-034 Rev. -16 November 1981



APR 22 1982

#### J24 FILTER (54578)

10.2.6 <u>Induct</u>	or Test Data		
S/N:,/ ·	Temperature	AMB	
Testing Phase:	FINAL PERFORMANCE	\$	
REF. PARA.	DESCRIPTION	LIMITS	<b>MEASUREMENT</b>
5.2.5.3.2	Resonance Measurement	1800 <u>+</u> 400 Hz	<u> 1923</u> Hz
	l s f	(455uSec (T (714uSec)	520 june
<b>5.2.5.3.3</b>	Resonance Measurement	1800 <u>÷</u> 400 Hz	2000 Hz
v. 6. v. v. d	1 e f	(455uSec <t <714usec)<="" td=""><td>Soone</td></t>	Soone

Strffelbock 60

4/21/82 Date

10.2.7

S/N: \_

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HAC TEST S32

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4PR 22 1986

#### J24 FILTER (54578)

AMB

Attenuation Characteristics Test Data

Temperature:

teacing ridae:	PINAL PEROXAMINA			
REF. PARA.	DESCRIPTION	LIMITS	MEASUREMENT	
5.2.5.4.1	Record Voltage for Following Frequencies			
	100 Hz	1.0 ± ,1V P-P	1.0	A b-b
•	450 Hz	1.0 + .3V P-P	1.1	V P-P
	6.3 KHz	.1 + .05V P-P	.09	V P-P
	20 KHz	10av + 3aiv mv P-1	, /o m	A B-B

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#### SANTA BARBARA RESEARCH CENTER A Subbidlery of Hughes Aircraft Company

A CONTROL OF THE PROPERTY OF T

INTERNAL MEMORANDUM

TO: F.R. Phillips

C: Distribution

DATE: 26 April 1982

REF: HS 236-7956 PE 96:82

FRCM: L. O'Connell

SUBJECT: ENI Filter (P/N 54585 S/N 001)

BLDG. B-11 MAIL STA.

EXT. 6357

Subject Filter was subjected to extreme internal temperatures during the running of STR FLT 1 007 as the result of a short circuit in a breakout cable (This anomaly was reported on FR S8127, copy attached).

This office has investigated the problem to determine what effect the overheating has on the long term Reliability of the filter. The results of this study are documented in IDC's PE 86:82 and PE 88:82 (copies attached),

In addition to the above inventigation, the undersigned has discussed the problem with G. Benson (Power Supply REA) and he recommended that all of the components be removed and replaced because the excessive heat degraded the Reliability of the components.

#### CONCLUSIONS

Based on the Thermal Analysis conducted by Reliability, the opinions of the REA (G. Beugon) and the undersigned, it has been concluded that the internal components of subject filter have been overstressed and their longevity is suspect. Even though the filter passed re-test, the ability of the device to perform over an extended period of time is too uncertain to warrant certification as Flight hardware.

#### RECOMMENDATIONS

The following options are offered for your consideration:

- 1. Use EMI Filter (S/N 001) for test purposes only while a new EMI filter is being fabricated at El Segundo.
- 2. Rework EMI Filter (S/N 001) by removing and replacing all components.

O'Connell

Reliability Manager

Thematic Mapper Program

LOC:jc

#### Santa Barbara Research Center A SANSSELV OF MUSICAL RICCORT COMPONY

#### INTERNAL MEMORANDUM

TO: L. O'Connell

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DATE: 16 April 1982

REF: PE 88:82

SUDJECT: Reliability Analysis of

Discrepancy recorded on Failure Report S8127

FROM: A. Perline

BLDG. B-II MAIL STA.39 EXT. 6106

Reference: Internal Messa PE 86:82 of 13 April 1982 1.

> 2. BS 236-7783

3. Peilure Report 98127

Subject Failure Report was reviewed from a Reliability viewpoint to provide an estimate of the effects of overheating that occurred at the time of the failure. The manufacturer of the inductor yes contacted and he edvised no that 21 gage HP negget wire could withsteed a 200°C temperature for a very short period and that 170°C vac ito regime operating tomperature.

These temperature constraints agree closely with the estimated 180°C energting temperature for 30,000 hours of life quoted by SEAT (metale percental.

The enalysis in reference I is represed in essections; I to this seems. It shows that the inductor temperature will reach at least 260° C.

Amother approach is presented in attachment 2 as a crosscheck. The calculations show that temperature at the inductor will exceed 266°C.

Less of the inductor to as open circuit would impose a lose of SMA heater function A short circuit would degrade the low frequency filtering capability of the unit.

Considering the fact that the wire should not be subjected to temperatures above 200°C, it is my position that the Reliability of this unit has been degraded and the filter should not be used in the Flight Unit.

Perline

AP:jc

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#### TREPERATURE CALCULATIONS FOR J-25 FILTER INDUCTOR

Current through Inductor

6 400

Carrie Code Cor. Besistance

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.360 chans

Temerature rise (from HS 236-7783)

18° C/A

Power Bissipated:

Temperature Change:

Power I Temperature Rise - (12.96) (18) - 233°C

Induster Tapparature:

Ambient + Temperature Change - 28°C + 233°C - 261°C Inductor Temperature

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#### ALTEGRATE TEXPERATURE CALCULATIONS FOR J24 PILTER INDUCTOR

Current Through Inductor (I)

6 Auspa .360.chara

Leductor Resistance (B)
Coefficient of Thermal
Conductivity of Formal Grathese (k)

Theoretical downs surrounding inductor

1.9 cm I.D.K. 3.81 cm 0.D. X 2.56 cm Thick

Conductivity:

$$\Delta T = \frac{Q}{C}$$
 $\Delta T = \frac{12.96}{0524} = 238^{\circ}$ 

Inductor Temperature: Ambient + Temperature Change - 28°C + 238°C - 266°C

Where: T, is the C.D.

is the I.D.

esendated eds elist

Q - 12 - 12.96

AT - Temperature change

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· SPACE AND COMMUNICATIONS GROUP

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TEST EQUIPMENT

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#### Failure Reports

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Deviations

D-160

Waivers None Open None

	REQUEST FOR D		VER	Program Inst. DATE PRE 07-08-82	PARED	0 0	RIGINAL F POOR	QUALI	ťΥ	
	1 GRIGINATOR NA	EZBROOL OPA BM	SBRC 75 Coromar Goleta CA				2 X DEVIA	1100 		I VER
TM	Calibrator	11323	FOR DEVIATION/		5 BASE LINE	MLLO. CATED	PROD.		YSTEMS/COM	
			NS AFFECTED-TES				DRAWINGS AF			
		MER COOK	SPEC /00C. NO	SON	MEN CODE	<del></del>	13924	ec.	40R. NO.	
	4. 5YSTON	<del></del>			11323	726	II.	U		
	E TEST PLAN									
	T.M. CALIBR	RATOR ASSE	MBLYSHIM R	RETICLE, SPA		ξ.	assification o	NAS-5	-24200	
	T.M. CALIBR				II		MINUR		a Ca	TICH
	SPACER' RETIO	ILE	4/recite (1 6	K187793	17. LOT NO	8 ea 2 ea	TYES	WG DEVIATIO	NA AVI AEU	
	NONE	STIPHICE	7	72611 - D	EFFECT ON	OEF1 KEDA 2	CHECULE			
	NONE		TIC SUPPORT, INTER	RFACE, ETC.						
	23 DESCRIPTION		NON-RELEASE	DRAWING FOR	FABRICATI	ING THE	FOLLOWI	NG ITEM	S:	
		1) SK10	779 SPACER, 793 SHIM, RE	RETAINER		8	ea.			
			EMS 1 AND 2 SPACERS TO							

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THE ABOVE ITEMS WILL BE USED ON THE T.M. CALIBRATOR. THIS DEVIATION WILL AUTHORIZE ITS USE WITHOUT RELEASE DRAWINGS. ASSEMBLY OF THE ITEMS WILL BE INCORPORATED BY FORMAL SUPPLEMENTAL PLANNING AGAINST THE T.M. CALIBRATOR SERNO 002, P/N 72611.

REA W. Balinoka SYS ENGR	PE Did 41 June 7/1
729127 SERNO 002 OTALY	CHO & Orgone 7/15/82
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## SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

**S** 8371

#### 4.2 REQUESTS FOR DEVIATION/WAIVER

The following pages list the Requests for Deviation or Requests for Waiver submitted for the Flight Model Thematic Mapper, by number, description, and current status.

Copies of Requests for Deviation/Waiver that were submitted for particular subsystems are included in the Appropriate subsection of Volume II of this report. Copies of Requests for Deviation/Waiver submitted against the instrument are included herein.

DEVIATION NUMBER	DESCRIPTION	STATUS	
D-128 PROCEDURE	AUTHORIZATION TO MODIFY WIRF BOND CONNECTION	Approved	
D-129 DRAWING	Use of Alternate Terminal Assy.	Approved	
D-130 Hardware/Procedure	ALTERNATE COMP. PLACEMENT	APPROVED	
D-131 Hardware/Procedure	ALTERNATE COMP. PLACEMENT	Approved	
D-133 Hardware/Drawing	ALTERNATE WIRING, CAL SHUTTER BACK	Approved	OF F
D-134 Procedure	REDUNDANT SHUTTER CABLE SUPPORT PIN	Approved	ORIGINAL PAGE IS OF POOR QUALITY
D-135 Procedure/Hardware	ALTERNATE WIRING - POSTAMP BAND 3	Approved	PAGE
D-136 Hardware/Procedure/ Drawing	Band -6, Voltage Regulator, SERIES RESISTOR CHANGE.	Approved	<b>∀</b>
D-137 Procedure/Hardware Drawing	Cal Shutter Backup - Timing Jitter Correction	Approved	
D-138 PROCEDURE	DOCUMENTATION DEFICIENCY OF TELESCOPE THERMISTORES.	Approved	
D-139 Procedure	Spliced Inchworm Leads - Reylay Optics	CANCELLED	
D-141 (SPARE) PROCEDURE/HARDWARE	PERMISSION TO USE COOLER CABLES OF PREVIOUS DESIGN	Approved	

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DEVIATION NUMBER	DESCRIPTION	STATUS
D-142 (Spare) Procedure/Hardware	PERMISSION TO USE AG EPOXY BONDS	Approved
D-143 Procedure	TM Configuration for starting IA-07 Test	Approved
D-144 Procedure	TEST WITH OPEN 208 KHZ SYNC LINES	APPROVED
D-145 Procedure	EMI TEST TEST DELETIONS	PENDING
D-146 Procedure	TM Configuration for starting IA-07 Test	APPROVED 9
D-147 Hardware/Procedure	Soldering of two resistors to R130 Pads	APPROVED OR INAL
D-148 Procedure	PERMISSION TO USE EM TM 32015-618 INSTEAD OF TP 32015-626 FOR MASS PROPERTIES DETERMINATION	APPROVED OF POOR POOR QUALITY  PENDING ON
D-150 Hardware/ Procedure/ Drawing	ALTERNATE WIRING	Approved
D-154 Procedure	Use Optional ACO7 Test Configuration for ACO7 testing.	Approved
D-155 Procedure	Use Band 4 Detector 7 to conduct IAO4 Test	Approved
D-156 Procedure	CALCULATE BAND 6 IGFOVS FROM COMPONENT LEVEL SPOT SCAN MEASUREMENTS	Approved

DEVIAT	ION_NUMBER	DESCRIPTION	STATUS
D-157	Procedure	USE OF MOTOR FROM UNCONTROLLED STORAGE	PENDING
D-158	Procedure	EMI/EMC TESTS DELTION	Approved
D-159	Drawing/Hardware/ Procedural	ALTERNATE WIRING	APPROVED
D-160	PROCEDURAL	USE OF NON-RELEASE DRAWING FOR FABRICATING THE FOLLOWING ITEMS:	Approved
		1) SK10779 SPACER, RETAINER	8 EA
		2) SK10793 SHIM, RETICLE	
D-161	Procedural	ALLOW DEVIATION FROM FLIGHT CONFIGURATION FOR ACO2. AC22 + S-T: F1-015.	ORIGINAL PAGE IS OF POOR QUALITY APPROVED
D-162	Procedural	CONTINUE AL TESTS AND DO BL TESTS WITH PARTIAL TM CONFIGURATION.	APPROVED JALITY
D-163	PROCEDURAL	MANUAL OPERATION OF CALIBRATOR CONTROL CONSOLE (CCC)	Approved
D-164	Procedural	Manual Uperation of Calibrator Control Console (CCC).	Approved
D-165	Procedual	PERMISSION TO PERFORM BLO7, BL12, BL16 AND BL19/20 TESTS WITH PARTIAL TM CONFIGURATION	Approved
		SUMMARIZE AS OF 7-26-82	

WAIVER NUMBER	DESCRIPTION	STATUS	
W109 HARDWARE	PERMISSION TO ASSEMBLE B7 DETECTOR WITH DISCREPANT BAND 5 DETECTOR.	Approved	
W110 HARDWARE	PERMISSION TO TEST AND REPAIR DISCREPANT BAND 7 DETECTOR.	APPROVED	
W111 Hardware	PERMISSION TO CONTINUE DISCREPANT BAND 5 & 7 DETECTORS,	APPROVED	
W112 HARDWARE	PERMISSION TO CONTINUE THRU FPA ASSY, 50795 W/BAND 3, CH 9 WIDE BAND NOISE OF 2.9 PA.	APPROVED	ORIGINAL PAGE IS
W113 HARDWARE	PERMISSION TO USE NONCONFORMING INSB DETECTORS.	APPROVED	に17 18 18 18 18 18 18 18 18 18 18 18 18 18
W114 Hardware	PERMISSION TO PROCEED W/BAND 4 CH 21 NOISE OF 7.8 pA.	APPROVED	
W115 Procedure/ Hardware	PERMISSION TO USE BAND 2 BAND LEVEL ASSY. S/N 401.	Approved	
W116 Hardware/ Procedure	PERMISSION TO USE BAND 3 BAND LEVEL ASSY. S/N 201.	APPROVED	
W117 Hardware/ Procedure	PERMISSION TO USE BAND 4 BAND LEVEL ASSY, S/N 201.	Approved	

WALVER NUMBER	DESCRIPTION	<u>status</u>	
W118 Hardware/Procedure	PERMISSION TO USE PFPA W/BAND AND CH. 16 NOISE OF 2.8 pA.	Approved	
W119 Hardware/Procedure	PERMISSION TO USE HALF-BAND 207-1	Approved	
W120 HARDWARE/PROCEDURE	PERMISSION TO USE BAND 4 POSTAMP S/N 201.	Approved	
W121 HARDWARE/PROCEDURE (SCAN MIRROR)	To runaround time exceeds specification.	Approved	
W122 Procedure	PERMISSION TO REPAIR BAND 7 INSB DETECTOR.	Approved	ORIGINAL PAGE IS
W123 PROCEDURE	PERMISSION TO USE BAND 1 BAND LEVEL ASSY, S/N 401	APPROVED	C PAGE !
W124 HARDWARE/ Procedure	MINOR PERFORMANCE DISCREPANCIES S/N 003 MUX	APPROVED	~ ω
W125 HARDWARE (MULTIPLEXER)	BROKEN SCREW IN ONE MUX MOUNTING HOLE.	Approved	
W126 HARDWARE	PERMISSION TO USE PFPA W/BAND ] MISALIGNMENT	Approved	
W129	HARDWARE TELESCOPE HOUSING. BLACK PAINT FLAKING.	CANCELLED	

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WALVER NUMBER	DESCRIPTION	STATUS	
W130 (Spare) Hardware	PERMISSION TO USE SPARE CFPA WITH DAMAGED TRACES.	APPROVED	
W132 HARDWARE	PERMISSION TO USE INSB DETECTOR ARRAYS	Approved	
WJ33 HARDWARE	PERMISSION TO USE NON-CONFORMING INSB Detectors.	Approved	
W134 HARDWARE	PERMISSION TO USE LFPA w/void in CIRCUIT TRACE.	Approved	
W135 HARDWARE/ Procedure	PERMISSION TO USE FLCFPA W/DISC REP PER FR 8208.	Approved	ORIGIN OF PO
W136 HARDWARE/ Procedure	LOW VALUE FOR TELESCOPE MTF	Approved	ORIGINAL PAGE IS OF POOR QUALITY
W137 Procedure/ Hardware	REFLECTANCE OF TELESCOPE OPTICS	Approved	T7 13
W138 HARDWARE/PROCEDURE (PF/FL)	Stress Level of Pulse-width Modulator (90997-2)	Approved	
W139 HARD' IRE	SOLITHANE CONFORMAL COATING	Approved	
W140 Procedure	Missing Planning for 51787 Thermistor Black Assy.	Approved	

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WAIVER NUMBER	DESCRIPTION	STATUS	
W141 Procedure	MISSING PLANNING FOR SCREW TRIM OPERATION.	Approved	
W142 HARDWARE/ Procedure	PERMISSION TO USE F-J CFPA WITH DISCREPANT SUBSTRATE	Approved	
W143 Procedure	No planning for EO 8842 - Baffle Assy.	Approved	
W144 Procedure	DEVIATION FOR RADIATIVE COOLER TEST PLAN	Approved	_
W145 Procedure	WAIVER FOR IANIK TEST PROCEDURE	Approved	ORIGIN OF PO
W146 Procedure (PF-F-S)	PERMISSION TO USE HCT DETECTORS MADE WITHOUT RELEASE PLANNING.	Approved	ORIGINAL PAGE IS
W-147 Procedure	DEVIATION FROM RAD COOLER TEST PLAN	Approved	7 2
W-148 PROCEDURE	WAIVER ON TOLERANCE OF PFP TO SCAN DIRECTION ALIGNMENT.	Approved	
W-1:19 HARDWARE	Waiver for padiative Cooler circuit diagram.	Approved	
W-150 Procedure/Hardware	SPLICE EBTCE CABLES	Approved	
W-J51 Procedure	Permission to shorten Temperature Control Test	Approved	

WATVE	R_NUMBER	DESCRIPTION	STATUS
W-152	(Spare) Hardware	PERMISSION TO USE NON-CONFORMING INSB DETECTORS.	APPROVED
W-153	(Spare) Procedure/ Hardware	Permission to use InSB Detectors from Lot 24 Wafer 21.	PENDING
W-154	(Spare) Hardware/Procedure	PERMISSION TO USE BAND LEVEL ASSY. S/N 503-2	PENDING OF POOR PENDING
W-155	(Spare) Hardware/Procedure	PERMISSION TO USE BAND LEVEL ASSY S/N 501-1	PENDING PAGE IS APPROVED
W-156	HARDWARE	TERMINAL BOARD TO REPLACE SPLICED COOLER DOOR MOTOR LEAD	APPROVED 3
W-157	(Spare) Hardware/Procedure	PERMISSION TO USE HALF BAND S/N 211-1	PENDING
₩-158	(Spare) Hardware/Procedure	Permission to use Half Band S/N 101-1	PENDING
W-160		Perform AC-2 test utilizing undocumented telemetry synchronizer.	Approved

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WAIVER NUMBER	DESCRIPTION	STATUS	
W-161 Hardware	PERMISSION TO USE CFPA WITH A BAND 5 DETECTOR THAT DOES NOT MEET SYSTEM SPECTRAL FLATNESS SPECIFICATION.	Pending '	
W-162 HARDWARE	PERMISSION TO PROCEED WITH F-1 SYSTEM BAND 5 TO BAND 7 REGISTRATION.	PENDING	ORIG OF F
W-163 HARDWARE	PERMISSION TO USE CFPA WITH FET OFFSETS > 10mV BAND -7 ch 7+15.	PENDING	ORIGINAL PAS OF POOR QUI
W-164 Procedural	PERMISSION TO USE SPARE CFPA WITHOUT PERFORMING NON-DESTRUCTIVE PULL TEST.	PENDING	PAGE IS QUALITY
W-165 HARDWARE	PERMISSION TO USE AS-IS WITH FOLLOWING DISCREPANCIES: THE SPECTRAL MATCHING VARIATION BETWEEN CHANNELS IS A MAXIMUM OF .065% IN BAND 1+1.07% IN BAND 4.	PENDING	
W-166 Procedural	A waiver is requested to delete CSO6 portion of EMI/EMC tests. Summarize as of 7-23-82.	APPROVED	

WAIVER NUMBER	DESCRIPTION	STATUS
W167 Hardware/Procedure	Permission to cut traces and use alternate wiring to install 16 resistors.	Approved
W168 Hardware	Permission to use BAND 5, CHANNEL 7 WITH COHERENT NOISE.	Approved
W169 Hardware	Permission to use bands 1 and 4 with spectral matching variations greater than 0.5%.	Approved On On One
W170 Hardware	Permission to use bands 1 and 4 with IFOV sizes greater than 43.2 and 46.35.	ORIGINAL PAGE IS OF POOR QUALITY APPROVED APPROVED
W171 Procedure	CHANGED FLIGHT ACCEPTANCE SINE VIBRATION LEVELS IN THRUST AXIS.	APPROVED Z
W172 Hardware	PERMISSION TO USE SPARE MULTIPLEXER HYBRID MICRO-CIRCUIT WITH SETTLING TIME OF 26 NANOSECONDS MAX.	Approved
W173 Procedure	PERMISSION TO DELETE REQUIREMENT TO PROVIDE A TELESCOPE BASEPLATE TEMPERATURE TELEMETRY CHANNEL.	Approved
W174 Hardware	PERMISSION TO USE WITH OUT-OF-FIELD RESPONSE. SHOULD BE LESS THAN 1%, IS 3.4%.	Approved.

# ADDENDUM FOR PRE-SHIPMENT REVIEW

WAIVER NUMBER	DESCRIPTION	STATUS
W175 Procedure	Permission to accept test segment 2 of TP 32015-625 that was conducted at a bus voltage of 28V instead of 23V.	Approved
W176 Procedure	Permission to run STR F-1 029 and F-1 033 in lieu of BL 19/20 Mini 3B and BL 19/20 mini 4B.	APPROVED
W177 Procedure	Permission to delete TVS 6 orbit 8 and resequence TV TS 6 orbit 12, orbit 13 and 14 to follow TVTS 6 orbit 7.	Approved

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ORIGINAL PAGE IS OF POOR QUALITY Program Instruction 010 REQUEST FOR DEVIATION/WAIVER (SEE MIL-STD-680 OR 681 FOR INSTRUCTIONS) CRIGINATED NEST AND ACCESS
Santa Barbara Research Center MITAIVED X THAT VER 75 Coromar Dr., Goleta, CA 93117 KI MINOS 164,103 CRITICAL OTHER SYSTEM/CONFIGURATION I TOUS AFFECTED DESIGNATION FOR DEVIATION/VALVER SYS. CZSIG. FIT 1 11323 114 D-143 TIONAL CATED YES 8. DRAWINGS AFFECTED SPECIFICATIONS AFFECTED-TEST PLAN MAN. CODE 59 8C./00C. NO. 500 MFR. CODE NECTE B RIV. NOR. 110. e. SYSTEM 82577 TP32015-531 17924 None TEST PLAN O. CONTUACT NO. A LINE ITEM Thematic Mapper Configuration for Starting IA-07 Test NASS-24200 7M 51065 TEN MONEY ATURE 14. GEFECT CLASSIFICATION 12 CE NO. DEFECT = 7. MINES (WOOD med of PAGE OF LESSEST ASSESSED AFFECTED RECURRING DEVIATION MAINED 17. LOT 100. Test Procedure 21. EFFECY ON DEL VERY EFFECT ON COST/PRICE NONE None, if deviation is approved 22 (FFECT OR INTEGRATED LOGISTIC SUPPORT INTERFACE, ETC. ' ₹ NONE 23 DESCRIPTION OF DEVIATION PAINER Request authorization to start IA-07 531 (Power and Grounding) without the following items assembled on TM (51065): 1. Radiative Cooler 51200 2. Circuit Boards: 50920 Temp.Controller and dc Restore 50942 Temp.Control 50912 Band 6 Buffer 50908-1 Band 5 Buffer 50908-2 Band 7 Buffer 14 HEED FOR DEVIATION WAIVER To proceed with IA-07 testing until the assemblies are available for proper configuration for IA-07 Test. After installation of the Radiative Cooler and the Bands 5, 6, 7 Buffers, Sections 5.3.4 and 5.3.5.23 through 5.3.5.27 of TP 32015-531 will be conducted. Minor - System Engineering Majop/Critical - Program Manager APPROVAL/DISAPPROVAV APPROVAL RECOMMENDED

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#### INTERDEPARTMENTAL CORRESPONDENCE

TO: J. Engel

ORG:

cc: Distribution

DATE: Sept. 14, 1981

REF. HS236-2237

SUBJECT: EMI/EME Retest (Engineering Model Mapper)

FROM: T. Ban

BLDG. SI LOC. SC MAILSTA D339 EXT. 5-8811

#### INTRODUCTION:

In the initial EMI/EMC test of the Engineering Model Themstic Mapper, it was found that the Mapper was susceptible in specific frequency ranges to conducted interference. In particular, during the conduct of tests CSO1 and CSO2, the Mapper exhibited general susceptibility throughout the frequency range of 6 Khtz to 80 Khtz. The susceptibility peaks occurred in the frequency range from 20 Khts to 45 Khts.

Throughout the remainder of the EMI/EME test, i.e., radiated susceptibility and tests which examined the Mapper's immunity to spikes on the power line, only two merginal performance inquiries were noted.

- The Mapper radiated a 10 Mhts interference is the vacinity of J-18, J-19 and J-24.
- 2. Inserting a 28 V negative spike in the 28 V return line resulted in the shutter losing "phase lock". Retesting, briefly, with a reduced negative spike of 26 V on the 28 V return line resulted in no anomalous shutter behavior.

#### SUBJECT:

I. Retests conducted to ascertain the correlation between susceptibility signatures to specific changes in BTCE/Mapper growding configurations provided little or no conclusive data relevant to "improved" performance. All tests run with the intent of achieving an acceptable mapper susceptibility profile through a variation in the system grounding scheme resulted in susceptibility signatures which similiarly characterized the Mapper during the initial EMI/EMC tests.

Noteworthy, in the analysis of retest results is the fact that although apparent improvements were observed with certain grounding configurations, these improvements were:

- 1. The result of monitoring channels with lower gain.
- The result of CSO1/CSO2 test configurations which also exhibited higher Mapper immunity during the initial test.
- The result of the "subjective" determination of when a particular recovery threshold occurs.

For the most part if performance improvements could not be categorized in the aforementioned, these improvements were not significant in frequency range or magnitude to be worthy of note.

# ORIGINAL PAGE 13 - OF POOR QUALITY

II. Retests conducted to evaluate the Engineering Model Mapper's susceptibility signatures to conducted interference with 8 Ehts filters incerted between the interference source and the Mapper are depicted in graphs 1 and 2.

The RF source injection method for the frequency range of 20 Hts to 50 Khts was inductive and for the frequency range 50 Khts to 150 Khts was capacitive. The two different injection methods created noise signatures to very in curve continuity, i.e., for the range from 11 to 50 Khts, no noice was visible/discornable on the Comptol and the Demum D/A output, whereas noise was definitely visible, although in low counts, at the beginning of CSO2 (50 Khts). (Example graph 1).

The upper trace of the graphs depict the values at which noise recovery was exhibited, labeled threshold voltage P.P. and the lower trace shows recognizable interference as a function of injected RF frequency.

- A. Graph 1 depicts the interference signatures with the RF source inserted into the 28 V line. The graph is a composite of a variety of tests run:
  - 1. With the source swept from 20 Htm to 150 Khtm.
  - 2. With the Kepco power at 25 V and 28 V.

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- 3. With the Mapper in "Picture Mode" via Power Supply 1 or 2.
- 4. With the source inserted first in J-18 then J-19.
- 5. With the count's recorded monitoring Band 1 Detector 1 or 2 (high gain channels).
- 6. With a second filter in and out of the return line.

In the above discussed configurations and variations the interference signatures were essentially identical. Peaks and nodes where recognizable noise patterns were observed were at 11 Khts and 55 Khts.

B. Graph 2 shows the noise signatures observed with the RF source inserted into the 28 V return line. Again the graph is a composite of a variety of tests run with the configurations and variations discussed in II-A-(1-6) with the exception of item 6 where the second filter was inserted and removed from the 28 V line. All combinations exhibited similiar if not identical interference signatures.

At 2.75 Khtz a Mapper noise susceptibility pattern occurred with a peak count of approximately 22. No susceptibility was evidenced in the frequency range greater that 50 Khtz. A possible accounting of this disparity, since interference was observed in a test with insertion in the 28 V line at 55 Khtz, could be due to the fact that the EMI instrument could only drive the load with 0.3 VPP at 50 Khtz, as shown on the upper trace of graph 2.

C. Filters were inserted into the 28 V return and 28 V line for J-24. Again the variations of test configurations discussed in II-A-(1-6) were run with RF injected in first the 28 V line then the 28 V return. No discernable noise was detected throughout the range of 20 Htz. to 150 Khtz.

#### SUMMARY

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With filters in all 28 V power (hot and return) to the Mapper, and observing a higher gain channel, noise was observed at 2.75 Mats (22 counts), 11 Mats (8 counts), and from 50 Mats to 75 Mats (Peak noise count of 15). The signatures depicted on Graphs 1 and 2 show marked improvement in the Mappers conducted susceptibility with the addition of input filters when compared with the "prefilter" graphs 3 and 4. Also graphs 3 and 4 are composites of noise signatures exhibited during the initial tests observing Band 4 Detector 9 (one of the lower gain channels). Also of particular relevance is the lock of susceptibility with filters in the range of 20 Mats to 30 Mats, a frequency region the spacecraft is suspected of inserting interference into the 28 V power bus.

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5.1.2.73-79 Fusible Link Commands
5.1.2.84-89 Intem. Stage Heater Commands
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#### SANTA BARBARA RESEARCH CENTER A Subardiery of Hughes Aurcraft Company

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#### INTERNAL MEMORANDUM

TO: Distribution

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CC: Data Bank (8)

DATE: 11 June 1981

REP: HS236-7492

SUBJECT: Themstic Happer Engineering Model Weight and Center-of-Gravity

FROM: F. D. McLaughlin

BLDG. 774 MAIL STAL 79

EXT. 4351

The Thematic Happer Engineering Model (EM) weight and center-of-gravity were messured at SBRC on 1 June 1981 per test procedure TP32015-618, Rev. A. The results of this test are as follows:

A.	EH	Uncorrected Gross Weight (pounds/Kg)		528.51/239.73
B.	Ins	trument Configuration Items Missing		15.06/6.83
	1.	Thermal Louvers	2.09 pounds	
	2.	Thermal Elankets and Supports	11.37 pounds	
	3.	Side Panel	1.60 pounds	
c.	Exc	ess Configuration Items		4.95/2.25
	1.	Miscellaneous Instrumentation	4.75 pounds	
	2.	Miscellaneous connector protectors	0.1 pounds	
	3.	Ground wires	0.1 pounds	
D.		Corrected Gross Weight (pounds/Kg) + B - C = D)	•	538.62/244.32
D. E.	(A ·		Weight	<u>538.62/244.32</u> <u>-1.15/-0.52</u>
	(A	+ B - C = D)	Weight	
	Cor	+ B - C = D) rections Required to Project Protoflight	J	
	Cor	+ B - C = D) rections Required to Project Protoflight Conformal Coating of PWB's	+3.08 pounds	
	Cor	+ B - C = D) rections Required to Project Protoflight Conformal Coating of PWB's Radiation Plate Material	+3.08 pounds	
	Cor	+ B - C = D) rections Required to Project Protoflight Conformal Coating of PWB's Radiation Plate Material (EM weight, 17.70 pounds, Aluminum)	+3.08 pounds	
	(A · Cor 1. 2. 3.	+ B - C = D) rections Required to Project Protoflight Conformal Coating of PWB's Radiation Plate Material (EM weight, 17.70 pounds, Aluminum) (PF weight, 11.68 pounds, Beryllium) SMA - EM vs. PF (24.49 vs. 24.89)	+3.08 pounds -6.02 pounds	

P. D. McLaughlin to Distribution B5236-7492

11 June 1981 Page 2

P. Projected Weight of Protoflight Model

537.47/243.79

G. Center-of-Gravity

₹

Y = 11.64 inches

 $\bar{z} = 11.51$  inches

I - -13.5 inches\*

\*I not measured in this test

H. Comparison to Predicted Values

	Measured Value	Predicted Value	Difference
Engineering Model Weight (pounds)	538.62	None	_
PF Model Projected Weight (pounds)	537.47	542.16	-4.69 (0.87%)
. <del>T</del>	11.64	10.72*	0.92 inches roward Radiative Cooler
ž	11.91	11.24*	0.67 inches toward nadir

\*Values obtained in November 1979 from computer run.

F. D. McLaughlin, Systems Engineering

/lbg



INTERDEPARTMENTAL CORRESPONDENCE





cc: Distribution

DATE: 4 November 1981

44-29 ORG:

TO:

SUBJECT:

₹.

ť.

4131.12/1/146 REF.

Measured Mass Properties

A.H. Connor

D.C. Leamon FROM.

Thematic Mapper Proto-

41-31-10 ORG.

flight Model

532 BLDG.

MAIL STA H303

SC LOC

EXT. 88608

REF. 1: Thematic Mapper Interface Control Drawing 3533000-400 Rev C

Internal Memo HS236-1202-8, "Thematic Mapper Mass Properties REF. 2: Summary", F.D. McLaughlin to Distribution, Dtd. 19 Feb 1981.

Internal Memo HS236-7492, "Thematic Mapper Engineering Model **REF. 3:** Weight and Center-of-Gravity", F.D. McLaughlin to Distribution, Dtd. 11 Jun 1981.

Ref. 4: IDC HS236-2249, "Mass Properties Tare Items for Thematic Mapper Protoflight Model\*, F.D. McLaughlin to A.M. Carter, Dtd. 1 Oct 1981.

The attached tables present the mass properties of the thematic mapper (Protoflight Model) derived from mass properties testing.

Table I contains the predicted flight properties. The test data has been corrected for non-flight items included in the test configuration and flight items that were not included in the test configuration as listed in Ref. 4.

Table 2 depicts the reference coordinate system for center-of-gravity and moment of inertia data.

Table 3 compares measured mass properties data with drawing requirements and previous predictions. The "Y" and "Z" C.G. data compares favorably to data measured on the engineering model at SBRC (Ref. 3).

The predicted weight is 29.92 pounds less than the maximum allowable weight.

Mass Properties Engineering

#### THEMATIC MAPPER

ORIGINAL PAGE IS OF POOR QUALITY

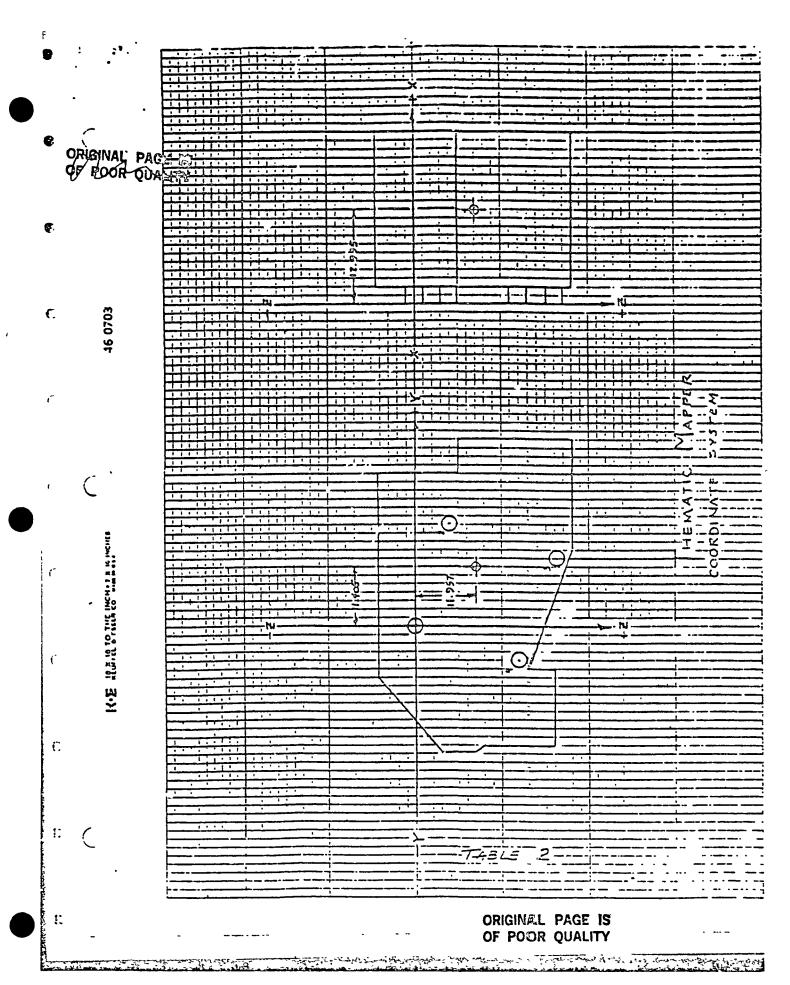
### MEASURED MASS PROPERTY DATA

PFH

₹	• • • • •	U.S. Customa	ery Units	SI (Met	ric Units)
	Weight:				
		538.87	Pounds	244.43	Kilograms
r.	•				
	Centers of Gravity:			•	
	X:	12.935	Inches	32.85	Centimeters
	Y:	111405	Inches	28.97	Centimeters ·
ť	<b>Z</b> :	11.957	Inches	30.37	Centimeters .
	Moments of Inertia:			•	
<i>(</i> -	Hzx:	274239	lb-in <sup>2</sup>		
		59.19	. sl-ft <sup>2</sup>	80.25	Kilogram-meter <sup>2</sup>
	lyy:	94195	lb-in <sup>2</sup>	•	
į.	*33 •	20.33	s1-ft <sup>2</sup>	27.57	Kilogram-meter <sup>2</sup>
; }	lzz:	237492	lb-in <sup>2</sup>		
	122:	51.26	sì-ft <sup>2</sup>	59.50	Kilogram-meter <sup>2</sup>
,	Products of Inertia:		•		
	Ixy:	2715	lb-in <sup>2</sup>		
		0.59	sl-ft <sup>2</sup>	. 0.79	Kilogram-meter <sup>2</sup>
	Ixz:	-518 <sup>°</sup>	lb-in <sup>2</sup>		•
(	•· ,	-0.17	sl-ft <sup>2</sup>	-0.15	Kilogram-meter <sup>2</sup>
r den	· Iyz:	20218	1b-in <sup>2</sup>		
t		4.36	s1-ft <sup>2</sup>	5.92	Kilogram-meter <sup>2</sup>

C - 3

TABLE 1



#### THEMATIC MAPPER

### MASS PROPERTIES STATUS

			•	
REFERENCE PARAMETER	AS TESTED	: REF 1 :: 1CD 353300-400	REF 2 HS 236- 1202-8	REF 3 HS 236- 7492
WEIGHT	538.87	568.79*	534.10	537.47
<b>x</b>	12.935	13.0	2 13 12	•
Y	11.405	11.2	10.72	11.64
, z	11.957	12.4	11.16	11.91
lx	59.19	· - ·	57.4	-
Iy	20.33	-	20.2	•
12	51.26	-	47.1	•-
Ixy	0.59	-	-0.51	-
lxz	-0.11	-	0.41	-
lyz	4.36	•	3.48	<b>-</b> ,

\*Maximum allowable weight per A Connor

(SEE BIL-STD-480 OF AL PUR INSTRUCTIONS)

UKIGINAL FAGE 10 REWIEST FUR UP. OF POOR QUALITY 28 May 1982 L WIGIRATOR HAND MID ADDRESS CONTATION LAIVED Santa Barbara Research Center X minos PALCE CRITICAL 75 Coromar Drive, Goleta, CA 4. DESIGNATION FOR DEVIATION/WAIVER S. DASE LIKE AFFECTED 6. OTHER SYSTEMS/CENTICLE RATION ITEMS AFFECTED 6. ISTR. COOK e. SVS. DEBIG. X 100 FLAC. Jaug-又跨 YES 11323 Plight 1 SPECIFICATIONS AFFECTED TEST PLAN 8. DRAWINGS AFFECTED tarn. COLE HOTEL COOS STEE./DOC. 120. 10.000 EEV. NOR. NO. e. EYETES S. ITEM 11323 TP32015-504# KLAN TEST Permission to Substitute Data Bases and HAS5-24200 Was Band 4 Detector 7 to Conduct IA04 Test TI. COMPTQUEATION THES ROW ROLLATURE 14. DEFECT CLASSIFICATION 12. 00 10. 13. COTELT NO. Thematic Happer MAJOR MINOS CRITICAL IS. EAST OF PART OF LOSEST ASSECULY AFFECTED G. PART IN. OF TYPE CESIE. 17. LOT 100. 18. 017 IS. RECURRING CEVIATION/BAIVER Test Procedure 51065 <u>-</u> G TO, EFFECT OF COST/PRICE 21. EFFECT ON DELIVERY SCHEDULE None, If Deviation Is Approved HONE 22. EFFECY ON INTEGRATED LOGISTIC SUPPOST, INTERPACE, LTC. 22. OSSCRIPTION OF DEVIATION/WAIVER Permission to change Data-Bases and use Band 4 Detector 7.

have the impact of creating a bad wersion of CHNCTR.IVF (For Detector 9 data since there is no signal) when it is called by CMD File.

\* {TMIIA6IA4.DAB;5 IA04BSL.DAB;2

NOTE (added on 820604) Band 4 Det 9 is the usual x=0, y=0 reference center for all detector center calculations. The B5D9 signal was not usable due to a SIU-cable problem. The set of det.9s were replaced by det.7s (BL,4,5,7). The loss of file CHNCTR.IVF is of no concern because the file is not used to do BBR.

24. MED FOR DEVIATION/BAIVER Cable

Detector 9, in Band 5, signal is not getting through SIU. Data Bases are set up to Ref. Band 4 Detector '9 signal as ORIGNXON IA04BBR. A fix may require a substantial amount of time and will necessitate demating most of the connectors.

25. PRODUCTION EFFECTIVITY BY SERIAL MANGE 551065 SIN 003 ONLY -TO SUBATTITUE ACTIVITY ALTHORIZING SIGNATURE APPROVAL/DISAPPROVAL 27 APPROVAL RECORDENDED DISAPPROVED E. COVERMENT ACTIVITY DATE 6/4/8 NASA GSEC

DD . 22 1694

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#### Program Instruction 010

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Santa Barbara Rosearch Cente				2	A?103	———إ	#31 VER
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6 DESIGNATION FOR DEVIATION/WALV	Meroniera no.	S. GASE LINE	MIECTED		d. OTH	MALEAS NO	WEECTED
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22. OESCRIPTION OF GEVIATION WALLER			<del></del>				-
This deviation is requested	to super	sede Dl	45 as c	rigina.	ily s	ubmit	ted.
Deviation is requested to wa	ive the	followi	ng test	requi.	ceusu	ts of	
GSPC 400.8-D-201, GSPC speci	Ilcation	- Them	atic Ma	ipper L	nterr	ace C	ontrol
a) Radiated Emission RE02	(Electr	ic Fiel	d)				
b) Radiated Emission RE04	(Magnet	ic Fiel	d)				
c) Radiated Susceptibilit	y RS03 (	E Field	)				
It is requested that the EMC	tost ra	wirema	nte for			01 6	cas
CS06, CE01, and CF03.		darreme	mes tot	. F-1 61		01, 6	aux,
14. HEED POR CEVILATION WALVER	Mada) a	ad Durat	~ 67 ÷ b +		(11)		
ENC tests of the Engineering instruments showed no signif.	MODEL a.	na prot ecoutib	oilignt	. woder	Them	atic e:_!a	Mapper
this has been confirmed by L	andsat-D	Spacec	raft EM	C tests	icea . B.	ridia	<b>#</b> :
Deletion of the above tests to	would el	iminate	the ne	cessity	ot	trans	porting
the Thematic Mapper and test for testing to he conducted	at SBRC	nt to a	n anc e	est rac	:1115	y; 21	
		•		· 2	D		97/86
<b>^</b> -					V VIII	1//	1/2/2
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IE. PRODUCTION EFFECTIVITY BY SERIAL MANGER	<del></del>		C14	1/2/			7-15-87
51065 SN 003 ONLY			C N/	، صححہ ہ	صحرع	~	1913-06
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Progress Instruction 010

THE RESIDENCE OF THE PROPERTY

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Santa B 75 Coro	HASE AND ACON			13 JUL	1982								
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S. SUBJUTION	PROVAL RECORMEN	ONIZINA, S. ZANU	خ راراً	BZ   7 APPROVAL	Ma /DISAPPO/VI	Set CI	Syst	a l	E II	rog	ering ram M	ana	7/15 ger
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REQUEST FOR	PEAL TLOM/AL	IVER	_	DATE PRE	LACO		10	POCURING A	CT HIST	142	
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75 Coronar	Drive, Go	leta, CA 9	3117					. K1808		MAJOR	□ ~
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#### Program Instruction 010

REQUEST FOR							E .		
1. 001G18A700 /	MATERIAL CON NON	19x	•		1982		12.		
Santa Ba	arbara Res	search Cen			J. A. Wall	ker	3. X MINOS	TION YOU	GALVER
	ericules and a	, Goleta,			3. DASE LINE	AFECTED			STORY CONFIGU
. KOOSL/TYPE	6. MFR. COS	E e. SYS. (	C631G. d.	967/M1758 49.	1	TALO.	F1200-	RATION	TOS MICTED
F) TM	11323	MT		0163	X ricea	CATED	LJUCT	7725	[x] NO
7.	SPECIFICAT	IONS AFFECTE		AM SCI	1278. CDGT	_	ORAWINGS AF	SECTED	KOR. 150.
e. SYSTCH	1323	TP32015-5		I Rev. A					
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TEST PLIA								10 CONTRACT	RO LINE I
Manual o	peration	of Calibra	ator Co	ntrol Con	sole (CCC	)		NAS5-24	
IT. CONFIGURAT	-						ummente e	* 619464	
Thematic	: Mapper A	Assembly			18. CD NO. 11	DEFECT AS	MIRCO	TASSIFICATI	
10 med 00 regt	CO COSEST 415D-C	OLY MICETED	10 Feet 100	. 00 TYPE DESIG	17. LOT NO. 11	s. grv	19. ESCURSIN		
	: Mapper A	Assembly	510	065	003	1	mes		X 150
20. EFFECT ON	COST/PRICE				2 day	delay	SCHEDULE		
II. EFFECT ON	INTEGRATED LOG	ISTIC SUPPORT.	INTERFACE.	EYC.	L-day	uc.uy	<del></del>		
23. DESCRIPTION	OF DEVIATION	VERIVER					_		
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six-posi 4.1, 4.4	tion mirr	rors.) The and 5.5.	e follow 2. ator inc	operative	graphs of ORIGINAL OF POOR	TP3201	5-518 wil		fected:
six-posi 4.1, 4.4 24. HEED FOR O Rotary S	EVIATION VAIVE Stages of	TM calibra	ator inc	operative	graphs of ORIGINAL OF POOR	TP3201	5-518 wil		fected:
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#### Program Instruction 010

	AME AND ADDRES				J. A. Wal	ker	2. X DEVI	ATION		WAIVE
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	operation	n of Calib	orator (	Control (	Console (	ccc)	****	NASS-24		LINE
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EFFECT ON COST/PRICE  EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC.					21 EFFECT ON DELIVERY SCHEDULE					
					2-day delay					
_	•									
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Santa B	arbara E	lesear							KA CEAL	17100		<u>ų:</u>	TIACO
75 Coro	mar Driv	re, Go	leta	CA 9	3117				XX HING	<u> </u>	RETOU	c	BITICAL
4	DESIGNATION					5. BASE LINE	MFECTE	Ď		6. OT	HER SYS	TEHS/CO	MFIGU.
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Performence Band 6	m of orviation m BLO7, ed. No p 5 board, 20 tests	Bbl2, eart o	BL10	e tes	st or t 6 meas	ha TP is urement: ORIGINAL	s afi	fec e i	ted by nvolve	the	a lac	ck o	
Performence Band 6	m of ceviation on BLO7, ad. No post board,	Bbl2, eart o	BL10	e tes	st or t 6 meas	he TP i	s afi	fec e i	ted by nvolve	the	a lac	ck o	
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CRIGINAL PAGE IS OF POOR QUALITY -: MEGUEST COR DEVIATION/VALVER .- (228 EL-STD-100 CB 101 FCB 18578UCTTORS) IS THE COMMATON HAME AND ADDRESS - CEVIATION X minte : Hughes Aircraft Co, El Segundo, CA A ... DESIGNATION FOR DEVIATION/BAIVER OTHER SYSTOMY CONTIGUE 6. E70. COOL . OVS. 62316. d. Granites - FREELITER PARE 452 T.M. W-172 SPECIFICATIONS AFFECTED-TEST PLAN 8 DRADINGS AFFECTED W70. CDC4 UFB. COGE DIC /605. 13. CENTER D BEATON TS 32015-031 A 4900 82577 6- 12ET OLES Eybrid 3905973 S/N 535 High Temperature Settling Time NAS5-24200 SIL ENGINEETICH ITEM MERING ATURE III CHILET C GIFECT QASSIFICATION X cress Twas - Multiplemer REQUESTING DEVIATION ON VER PAGE CO. 63 TYPE CO. 7 LOT 60. B/N 535 **XX** ---Analog Multiplexer Hybrid 3905973 EL WEELT CO DELIVER AFIECT OF COST/PRICE 2 month schedule slip of spare hybrid if disag Hone THE STREET OF INTEGRATED LOCISTIC REPORT, INTERPRESE, THE Hone AR CESCRIPTION OF DEVIATION WAIVER "Analog Multiplexer hybrid microcircuit 3905973, S/N 535 only, fails paragraph 4.7 of test specification TP 3905973 at high temperature (80°C) only. This paragraph covers settling time, should be 20 Nanoseconds max, is 26 nanoseconds. S/N 535, which is a spare hybrid, passes all specifications at all other temperatures. The effect of using this hybrid in a system would be a very slight increase in fa crosstalk between some sensors in the band where the hybrid was used. The crosstalk increase would be a maximum of one quantum step for a scene of full scale contrast only when the hybrid was at a temperature of 80° C. Since edges of full scale contrast are rare or nonexistent in real scenes and since the hybrid never reaches 80°C. no real effect would be anticipated. ME. WIED FOR CIVIATION BAIVER Repair and retest of the hybrid to comply with the high temperature settling time specification would cost approx. \$2,000 and delay the delivery of the hybrid by 2 months. Since the settling time as is would not significantly affect instrument performance, a llowing use of the hybrid as is is requested. Sys Engr Hybrid 3905973 S/N 530 only. Spare hybrid. שמו זוופל בנוויוזי שיישי על אוויווול ATTROVAL/SISAPPROVAL

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PEOUEST FOR DE- ATTOR TALVER THE BIL STO-ART OF ART FOR ASTRUCTIONS ---PROCES OF ACTION TO ME 20 Aug 82 Santa Barbara Research Center/S. G. Oxley ALIVES DEVIATION 75 Coromar Drive, Goleta, CA 93117 X 144.08 4. DESIGNATION FOR DEVIATION/WAIVED OTHER STETDIS/CONFIGURATION LITTERS MITTERS c. 371 0851G. 4. MODEL/TYPE 18. H/A 530E 11323 | WI 73 X 🖛 SPECIFICATIONS AFFECTED-TEST PLAN 8. DRADINGS AFFECTED ₹(C./00C NO. WR. CODE Ma CODE REV. a. SYSTEM 50904 40724 6. ITEM G E. TEST PLAN | Telescope Easerlate Temperature Channel Deletion NAS5-24200 TI. CONFIGURATION I'DE HOMENC ATURE DEFECT CLASSIFICATIO Thematic Mapper Tim wor COTONY T. MADELA TESTO, NO TANK OF DAMA RECLORING DEVIATION MAINER 51065 003 Thematic Mapper 10. EFFECT ON COST. POICE Approximately S1 'Ellion 3-Month schedule impact if disapproved. EFFECT ON INTERNATED LOGISTIC SUPPORT. 22. DESCRIPTION OF DEVIATION SALVER Delete the requirement to provide a telescope baseplate temperature telemetry channel. (Reference Failure Report F2718.) 14. MEED FOR DEVIATION BAIVER The telemetry channel is an open circuit; repair would entail unnecessary risk since the channel loss has no significant mission effect. Temperature of baseplate can be deduced from other temperatures such as the telescope housing and the cal lamp housing. 51065, Samo 003 only Systems Engineering 215422 - CV ML

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### Program Instruction 010

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75 Coromar  4 0  1000 1000 1000 1000 1000 1000 100	Drive ESIGNATION FOR CODE 11323 PECIFICATIONS WA. CODE  373 TONICAL VER CULUM Sequen TEM NOMENCANO IC Mapper COMEST ASSESS. MI	Goleta, R DEVIATIO C. SYS. DESI TM AFFECTED: SPEC./DOC.	TEST PLA	R ISSTANTIVES 40. W-177	TIGHAL	CATEO	ERAWINGS AF	6. OTHER SYS	Y NO
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#### 4.3 ENGINEERING CHANGE PROPOSALS

The following are copies of Engineering Change Proposals (ECP) submitted for the Flight Model Thematic Mapper.

P.O. Box	92919 -	ompany, S&CG Airport Station	n, Los Ai	ngeles, CA 9	00009	1		). œŝi
V	edeki ora reer ooki c	5 ECP DESIGN	ATION	<u>(14.1-170)</u>		S BASELINE		440-
. MODEL/TYPE	6. WFR CC	ODE & SYS DESIG. d.	. ECP NO.	e. TYPE /. REV	CORR	7 OTHER ST		G ITOMS
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. ITEM	7311	TP32015-500/A					<del></del>	+
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PACE ECR 6	EFFECTIVITY B  1 & Up  ITEM FFEE TIME N/A  T DELIVERY SC N/A	ITY	20	RETROFIT  FEMIP/VEHICLE  d. LOCATIONS OF	NONE  CLASS AVI  H/A  SAIP/VEHI  H/A  SET TOTAL C	FC TFD		
PAT ECR 6	EFFECTIVITY B  1 & Up  ITEM FITE TIN  N/A  T ORLIVERY SC  N/A  OSTS/SAVINGS	ITY HEDULE UNDER CONTRACT	20	RETROFIT  FEMIP/VEHICLE  d. LOCATIONS OF	NONE CLASS AND M/A SAMP/VEHI M/A	FC TFD		
PAT ECR 6	EFFECTIVITY B  1 & Up  ITEM FITE TIN  N/A  T ORLIVERY SC  N/A  OSTS/SAVINGS	MEDULE  UNDER CONTRACT  ST. 21.7. STANTURE		RETROFIT  F SHIP/VEHICLE  d. LOCATIONS OF  22 ESTIMATED N	NONE  CLASS AII  M/A  SAIPTVENI  M/A  LET TOTAL C	FC IFD CLE MANEERS		
PAT ECR 6	EFFECTIVITY B  1 & Up  ITEM FITE TIN  N/A  T ORLIVERY SC  N/A  OSTS/SAVINGS	HEDULE	rd	RETROFIT  F SHIP/VEHICLE  d. LOCATIONS OF  11TLE  HS236 Prog	NONE  CCLASS AND M/A  SALEPVENI M/A  CT TOTAL C  NONE  TEM MAT	FC IFD CLE MANEERS		
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bcc: LE Blanchard, EW Wilkins, JL Sharp, Data Bank HS236 (2), File

#### HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATIONS GROUP EL SEGUNDO, CALIFORNIA

In reply refer to: 78(44)21820/D4596 HS236/0019-0414

26 September 1978

National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt, Maryland 20771

Attention:

Mr. J. E. Firmin Procurement Manager Code 283/400.8 ORIGINAL PAGE IS OF POOR QUALITY

Subject

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Contract NAS5-24200, Thematic Mapper; Engineering Change Proposal No. 3, ECA No. 467040

Pursuant to Article XIV, Configuration Managemene, subject ECP for Thematic Mapper Interface Control Drawing 3533000-400, Revision A is herewith submitted for GSFC review and approval.

The Interface Control Drawing has been revised and updated as follows:

- 1. Completed the definition of the TM instrument outline and extremities.
- 2. Clarified fields of view for radiative cooler, thermal radiators, sun calibrator, and scan mirror.
- 3. Added installation requirements and mounting details.
- 4. Added electrical interface connector designations, furctions and locations.
- 5. Defined thermal requirements including thermal finishes.
- 6. Included current TM weight.
- 7. Added access requirements for purging, removal of protective covers, and requirements during testing and operations.
- 8. Revised the TM instrument coordinate system to be consistent with the requirement of GSFC 400.8-D-201.

There is no cost or schedule impact with this change.

Very truly yours,

HUGHES AIRCRAFT COMPANY

J. L. Sharp

Contract Negotiator, Sr. NASA Systems Division

cc: T. P. Sciacca, NASA Resident Representative

O. Weinstein, Code 400.8

L. Gonzales, Code 400.8

A. Hardesty, Code 283/400.8

J. Baniszewski, Code 283 (w/o encl.)

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ECP 004 Page 3 of 5

Proposed Thematic Mapper Interface Control Drawing (3533000-400, Rev. A) change.

1. Issue Revision B to 3533000-400A per attached blue)ine prints (2).

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#### STATEMENT OF WORK

#### CHANGE NO. 1; CHANGE MOUNTING FOOT DESIGN

#### Task I. Design and Drawing

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Conduct engineering design and analysis to specify new foot design.

Issue new foot design drawing. Change existing assembly and interface drawings as necessary to incorporate the requirements of the new foot design.

#### Task II. Structural Mechanics Analysis

Conduct the following analysis:

- A. Natural frequency and normal modes analysis for two cases which bound the results.
- B. Modal random response analysis (protoflight levels) to predict launch loads using frequencies and modes computed in A above.
- C. Self-induced transient analysis to predict on-oribt performance 'using frequencies and modes computed in A above.
- D. On-orbit thermal distortion analysis based upon Task III. B below.

#### Task III. Thermal Analysis and Documentation

- A. Revise the operational constraints summary and conduct analysis.
- B. Revise thermal analysis summary assuming 75 percent power supply efficiency with new spacecraft interface. Incorporate spacecraft backloads into analysis.

#### Task IV. Assembly and Test Fixture

Conduct engineering design and analysis to specify the new retrofit requirements for the assembly and test fixture. Revise existing drawings as necessary to reflect foot design changes.

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Task V. Procurement of TM Mounting Feet

Issue modification to subcontract and procure twelve (12) TM mounting feet of the revised design.

Task VI. Retrofit Machining of Assembly and Test Fixture

Issue modification to subcontract and retrofit machine two (2) assembly and test fixtures.

Task VII. Project Management and System Engineering

Provide Project Management and System Engineering supervision and direction for completion of the engineering effort.

CHANGE NO. 2: DELETE NADIR LOUVER

Change No. 2 is a no-cost change.

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#### **ENGINEERING CHANGE REQUEST**

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& CESCRIPTION OF PROBLEM

Connector location interferes with electronic module structure

PROPOSED SOLUTION

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See SBRC ECR attachments

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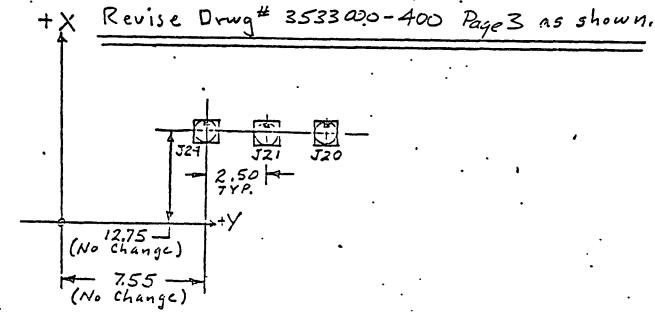
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INTRODUCTION

The IDC presented here examines four contributors to band 6 modulation, predicts the system modulation which will be observed, and recommends that the planned system level test not be conducted. As an alternative, subsystem level tests combined with system modeling are recommended to verify compliance with the system band 6 modulation specification.

SUMMARY OF RESULTS AND CONCLUSIONS

## The System Level Scan Modulation Specification

The specification for band of modulation should be changed to require that the peak-to-peak modulation be less than 1/2 percent of maximum signal level. The specification currently requires that the peak-to-peak modulation be less than 1/2 percent the average signal level. Meeting the current specification is theoretically impossible at scene radiation temperatures near the minimum (260°K). Also, at low scene temperatures, 1/2 percent of the signal is well below the quantizing noise.

The optical contributions to the system scan modulation are conservatively estimated to be less than 0.33 percent. These contributions result from motion of the scan mirror and the scan line corrector.

If the electronic subsystem specifications are met, the net electronic contribution to band 6 modulation will not excede 0.16 percent and the total band 6 modulation would be less than 0.49 percent.

Currently planned subsystem tests, combined with modeling and analysis, are sufficient to establish compliance with the band 6 modulation specification.

#### Need for System Level Tests

The currently planned system level band 6 modulation tests will not be capable of isolating and characterizing the subsystem contributions to system band 6 modulation. Much more extensive system testing is required to do this.

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It is not annotated that corrective ground based processing will be required to comply with the band of modulation specification. However, if it were required, the model used for ground correction would necessarily be based upon the results of subsystem level tests and modeling, not on system level tests.

## Necessary Conditions for Systems Level Testing

If the system level test is performed, the "uniform temperature plate" must be sufficiently rough and diffuse that no specular reflections are possible and the emissivity is independent of direction. Ideally, the plate surface would be a nondirectional blackbody.

A system level test cannot determine compliance with either the existing specification or the proposed modified specification unless preceded by band of radiometric calibration. Neither full scale nor average signal level are accurately defined before calibration.

### SUBSYSTEM CONTRIBUTIONS TO BAND 6 MODULATION

There are four subsystem contributors to band 6 modulation:
i) scan mirror reflectivity (variation with scan angle), 2) some line corrector, 3) detector/preamplifier ac coupling, and 4) video do restore. The contribution of each subsystem is discussed and the lotal contribution conservatively estimated in this section.

The contribution of each subsystem is expressed as a fraction of full scale rather than as a fraction of the average signal. The rationale for this choice is presented in the next section which discusses a problem with the system level specification.

#### Scan Mirror Reflectivity Contribution

To analyze the impact of scan mirror variations on band 6 modulation, consider the simplified model of Figure 1. The radiation from the mirror which results in irradiance, H, at the image plane consists of reflected radiation (image forming) and emitted radiation (nonimage forming or background). The irradiance of the image plane can then be expressed as

$$H = K \left\{ P(\theta) N(T_s) + \epsilon(\theta) N(T_m) \right\} + H_B$$
 (1)

where:

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N(T) = "in band" radiance of a blackbody at temperature, T

T<sub>s</sub> = radiation temperature of the scene

Tm = surface temperature of the mirror

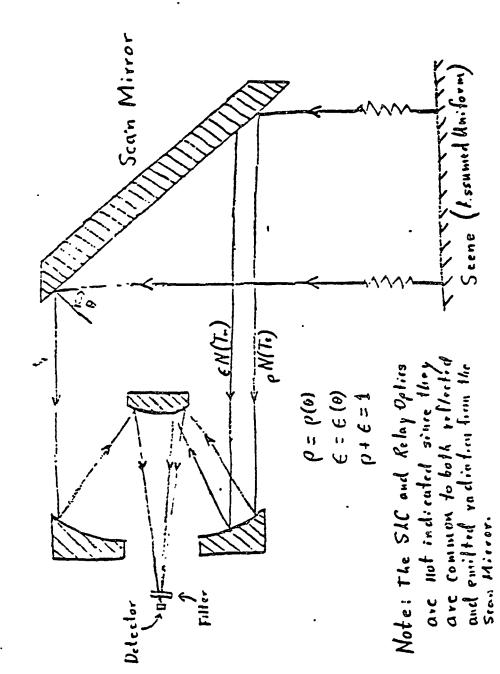


FIGURE 1. SCAN MIRROR MODULATION MODEL

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(θ) = mirror emissivity at angle

 $P(\theta) = mirror reflectivity at angle$ 

e = angle of incidence of the mirror

K = a constant which incorporates the lens and mirror

Hp '= background irradiance

From Kirchoff's radiation law as applied to an opaque reflecting surface,

$$P(\theta) \div \epsilon(\theta) = 1. \tag{2}$$

Substituting for  $\epsilon$  in Equation 1 and collecting the terms:

$$H = K \left\{ N(T_m) - o \left[ N(T_s) - N(T_m) \right] \right\} + H_B$$
 (3)

The incremental change,  $\Delta H_{p}$ , for a small change,  $\Delta \rho$  , can then be computed as

$$\Delta H_{\rho} = \frac{\partial H}{\partial \rho} \Delta^{\rho} = K \left[ N(T_{s}) - N(T_{m}) \right] \Delta^{\rho}$$
 (4)

For a full scale signal, the incremental change in focal plane irradiance,  $\Delta H_{\rm FS},$  is

$$\Delta H_{FS} = H(T_s^{Max}) - H(T_s^{Min})$$
 (5)

and substituting Equation 3 into Equation 5

$$\Delta H_{FS} = K \left[ N(T_s^{Max}) - N(T_s^{Min}) \right] P$$
 (6)

The fractional contribution to band 6 modulation, FP(Ts), is the ratio  $\Delta H_P/\Delta H_{FS}$ . Dividing Equation 5 by Equation 6 obtains:

$$F_{\rho}(T_{s}) = \frac{\Delta H_{0}}{\Delta H_{FS}} = \frac{\left[N(T_{s}) - N(T_{m})\right] \Delta \rho}{\left[N(T_{s}^{Max}) - N(T_{m}^{Min})\right] \rho}$$
(7)

Since N(T) is a monotonically increasing function of T, the extreme value of Fp(Ts) can be determined by computing the value at  $T_s = T_s^{\text{Max}}$  and  $T_s^{\text{Min}}$  and selecting the largest absolute value of the two.

For the Thematic Mapper, the following values apply:

Parameter	Value	Source
ρ	.953	(See Appendix A)
<b>△</b> P	.0055	(See Appendix A)
T <sup>Max</sup>	320°K	
$T_s^{ ext{Min}}$	260°K	
T <sub>err</sub>	294 <sup>0</sup> K	

which, substituted into Equation 7 and referring to blackbody tables produce:

$$F_{p}$$
 (320°K) = 2.4 x 10<sup>-3</sup> and

7.

 $F_{\rho}$  (260°K) = -3.1 x 10<sup>-3</sup>

The largest contribution to band 6 from the scan mirror is then 0.31 percent.

It is worth noting that scene radiation temperatures below 260°K and above 320°K would be clipped since they lie outside the band 6 dynamic range. The usefulness of the imagery would be seriously limited as the average scene radiation temperature approaches these dynamic range limits. Thus the 0.31 percent scan modulation contribution represents a conservative upper limit.

## Scan Line Corrector Contribution

The contribution of the scan line corrector to band 6 modulation results from the translation of the image of the telescope (as viewed from

the detector plane) over a :066 inch range. Since the mapper has been carefully designed to avoid vignetting, any modulation will be due to the slight changes of perspective which cause each detector to view an incrementally different solid angle of internal structural and baffling members. If only one of these members (the odd member) differs by  $\Delta T$  from the cavity temperature, the fractional contribution,  $F_{SLC}$ , can be estimated as:

$$F_{SLC} = R_{\Omega} \frac{\epsilon \Delta T}{T (60^{\circ} K)}.$$
 (8)

where:

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R<sub>Ω</sub> = ratio of the incremental change in solid angle of the odd member to the solid angle of the telescope exit pupil

= amissivity of the odd temperature member

= telescope effective transmission, including the
obscuration ratio

ΔT = temperature difference of the odd member (°K)

60°K - IM band 6 dynamic range

For the Thematic Mapper, the following values are representative

 $R_{\Omega} = 1.33 \times 10^{-3}$ 

£ = 0.0

 $\tau = 0.7$ 

which, substituted into Equation 8, yield

$$\mathbf{F}_{\mathsf{SLC}} = 2.5 \times 10^{-5} \Delta \mathsf{T} \tag{9}$$

If the odd member is assumed to be at a temperature difference  $8^{\circ}$ K from the cavity (an extreme value considering existing thermal predictions),  $F_{\rm SLC}$  becomes 2.0 x  $10^{-4}$ .

## AC Coupling Contribution

The signal from the detector preamplifier combination is ac coupled to the remainder of the video chain. This results in low frequency response that will result in some droop in the signal during a line scan. The subsystem specification limits this droop to not more than 0.1 percent of full scale signal.

## DC Restore Contribution

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The dc restore for band 6 is located in the multiplexor. The dc restore drift is restricted to 2.5 mV out of a full scale 4.0 volts. This translates into a fractional contribution of .06 percent.

## Total Band 6 Modulation\*

If the subsystem specifications for ac coupling and do restore are met, the upper limit of band of modulation is presented in the following tabulation. All modulation contributions are expressed as a percentage of full scale signal.

Subsystem	Modulation Contribution, %	References
Scan mirror	0.31	Derived function of P(8), Tm, Ts
SLC	0.02	Derived worst case, HS 236-5687
AC coupling	0.10	DS 32015-003B
DC restore	0.06	DS 32015-005
Total	0.49	

## A PROBLEM WITH THE SYSTEM SPECIFICATION

The system specification (GSFC S-726-9, paragraph 3.2.9.3) for scan modulation requires that the scan modulation be less than 1/2 percent of the average signal level of the scan. This presents two problems:

1) When the average signal level is relatively low within the dynamic range, 1/2 percent of the average level is far below the combined analog and quantizing noise of the system.

<sup>&</sup>quot;See Appendix B for a reconciliation between the table and the performance budget presented at the Detailed Design Review.

2) Certain contributors to scan modulation, while very small, do not approach zero as the signal level shrinks. As the average signal level approaches zero, these contributors alone will prevent the specification from being met. An example is analyzed and discussed below.

## Scan Mirror

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For illustration purposes, the scan mirror reflectivity will be allocated all of the scan modulation budget of 1/2 percert of the average signal level. From Equation 4 above, the scan modulation is then

$$\Delta H_{\rho} = K \left[ N(T_{s}) - N(T_{m}) \right] \Delta \rho$$
 (10)

The average signal level can be computed as

$$\Delta H_{\text{AVE}} = \frac{1}{0_2 - 6_1} \int_{\theta_1}^{\theta_2} \left[ H(T_s) - H(T_s) \right] d\theta \tag{11}$$

and substituting from Equation 3,

$$\Delta H_{\text{AVE}} = \frac{K}{\theta_2 - \theta_1} \left[ N(T_5) - N(T_5^{\text{Min}}) \right]_{\theta_2}^{\theta_1} \rho(\theta) d\theta$$

which may be expressed as

$$\Delta H_{AVE} = K \left[ N(T_s) - N(T_s^{Min}) \right] \rho_{AVE}$$
 (12)

wnere

$$\rho_{\text{AVE}} = \frac{1}{\theta_2 - \theta_1} \int_{\theta_1}^{\theta_2} \rho(\theta) \ d\theta$$

The specification requires the following relationship be satisfied:

$$\left| \frac{\Delta H_0}{\Delta H_{AVE}} \right| \le 0.005 \tag{13}$$

and substituting from Equations 10 and 12

$$\left| \frac{\left[ N(Ts) - N(Tm) \right] \Delta \rho}{\left[ N(Ts) - N(T_s^{Min}) \right] \rho_{AVE}} \right| \le 0.005 .$$
(14)

and dividing by PAVE:

$$\left| \frac{N(Ts) - N(Tm)}{N(Ts) - N(Ts)} \right| \le \frac{0.005}{\left| \frac{\Delta \rho}{AVE} \right|}$$
(15)

For the Themanc Mapper, the following values apply

$$\left| \frac{\Delta P}{P_{AVE}} \right| = 0.003$$

which, substituted into Equation 15, yield

$$\left| \frac{N(Ts) - N(294^{\circ}K)}{N(Ts) - N(260^{\circ}K)} \right| \le 1.67$$
 (16)

Remembering that N(T) is amonotonically imcreasing function of T, it is clear that as Ts approaches 260°K, the magnitude of the numerator remains finite while the denominator approaches zero. Clearly, Equation 16 cannot be satisfied as Ts approaches 260°K.

Equation 16 demonstrates that the system specification cannot be met throughout the scene temperature dynamic range even if all of the error budget were allocated to the scan mirror. This is true while the worst case contribution of the scan mirror reflectivity is only .62 times one quantizing level.

#### COMMENTS

Comments on the system level test are as follows:

- 1) If band of scan modulation is to be measured on a systems level, the test must be performed with actual subsystems. Since the multiplexer will not be available at the time the test is scheduled, the test should be postponed.
- 2) The worst case contribution of the scan mirror reflectivity occurs at 260°K (8°F). If the worst cases are to be included in the test, the plate should be cooled to this temperature. Of course, when the test plate is well below the room (or cavity temperature), its reflectivity must be very low to avoid invalidating the test. Condensation may also be a problem.
- 3) If the test were conducted with the test plate at the same temperature as the scan mirror, Equation 4 shows that the scan modulation contribution of the mirror reflectivity would be zero, independent of the variation in reflectivity over the scan.
- 4) If the test plate is only going to be operated above the mirror temperature, the surface should be rough (diffuse) and its emissivity known. The emissivity need not approach 1.
- 5) The key element in conducting a valid experimental assessment of the contribution of scan line corrector is that the internal structural members of the telescope assume the actual dynamic temperatures which would occur during an orbital cycle. A method is required to force these temperatures to comply with predicted values or, alternatively, to simulate the critical environment.
- 6) The system level test requires the output of band 6 calibration to determine compliance with the system specification.

#### RECOMMENDATIONS

The following recommendations are made:

 Replace system level test with subsystem (or unit) tests and the above analysis.

- 2) Review the subsystem tests planned to establish compliance for the dc restore and the ac coupling. Make certain the tests are conducted in a manner which will permit these subsystems to be characterized as well as measured.
- 3) Negotiate a change in the scan modulation specification to allow 1/2 percent of full scale signal rather than 1/2 percent of the average signal.

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APPENDIX A. Band 6 Reflectivity Over the Angular Range

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During the time which imagery is being collected, the angle of incidence at the scan mirror ranges linearly from  $31^{\circ}$  to  $39^{\circ}$ . The band 6 bandpass is from  $10.5 \, \mu m$  to  $12.5 \, \mu m$ .

From the average reflectivity values computed by Tim Wise and Sam Pellicori, the following table was constructed:

λ (μm)	P (31°)	P (39°)	Δρ
10 5	0.9581	0.9494	0.0087
11.5	0.9753	0.9692	0.0061
12.5	0.9832	0.9814	0.0018
Averages	0.9	667	0.0055

#### APPENDIX B. Reconciliation

The scan modulation performance budget developed in this IDC is significantly different than that presented at the Detailed Design Review (HS 236-0677, Table 2.1-16, p. 2-41). The new performance budget reflects a refinement of the underlying analysis as well as the current status of subsystem development and testing.

## Scan Mirror Reflectivity and Polarization

The scan mirror reflectivity and polarization changed from 0.30 percent to 0.31 percent. While the numerical change is small, the analytical bases for the values are quite different. The annicipated up over and 6 is now 0.55 percent rather than 0.2 to 0.3 percent. However, when the mirror self-emission is accounted for, the contribution to band 6 modulation is 0.31 percent under worst case conditions.

### Scan Line Corrector

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It was previously assumed that the scm line corrector contribution to band o modulation resulted from the angle of incidence, the position of the beam on the corrector mirrors, and the presence of strong lateral thermal gradients on these mirrors. However, this is no longer the case. The scan line corrector contribution is now understood to result from small perspective changes of internal members of the telescope as viewed by the detectors.

## Signal Droop

Signal droop is treated as two separate contributors, do restore and ac coupling. We now anticipate that the subsystem specification for the multiplexer do restore circuit will be readily met, producing a contribution not to exceed 0.06 percent.

The ac coupling contribution to band 6 modulation as defined in the top line specification is actually negligible. This is because band 6 modulation is defined as the response to a uniform scene. Ac coupling only contributes to band 6 modulation when the scene average temperature is changing, not when it is uniform. In the new performance budget, a conservative upper limit of 0.1 percent (the subsystem specification) has been assumed.

In flight operation, the ac coupling will contribute to band 6 Modulation since the average scene temperature changes along track. The along-track radiation temperature gradients for which 0.1 percent modulation will not be exceeded are discussed later in this appendix.

## Stray Radiance

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When current measurements of the scattering properties of the scan mirror surface in the band of region are considered, the stray radiance in this band is found to vary less than 0.01 percent as the mirror scans. For this reason, this contribution is not included in the performance budget of this IDC.

## Component Temperature Variations

Component temperature variations are considered in the scan line corrector contribution since this is the way they can significantly contribute during a 60 ms active scan. They are not separately considered.

Finally, note that this IDC algebraically sums the contributions to band 6 modulation to estimate total modulation. This is more conservative than root sum squaring them as was done in HS 236-0677, Table 2.1-16.

## Ac Coupling, In-Flight Contribution

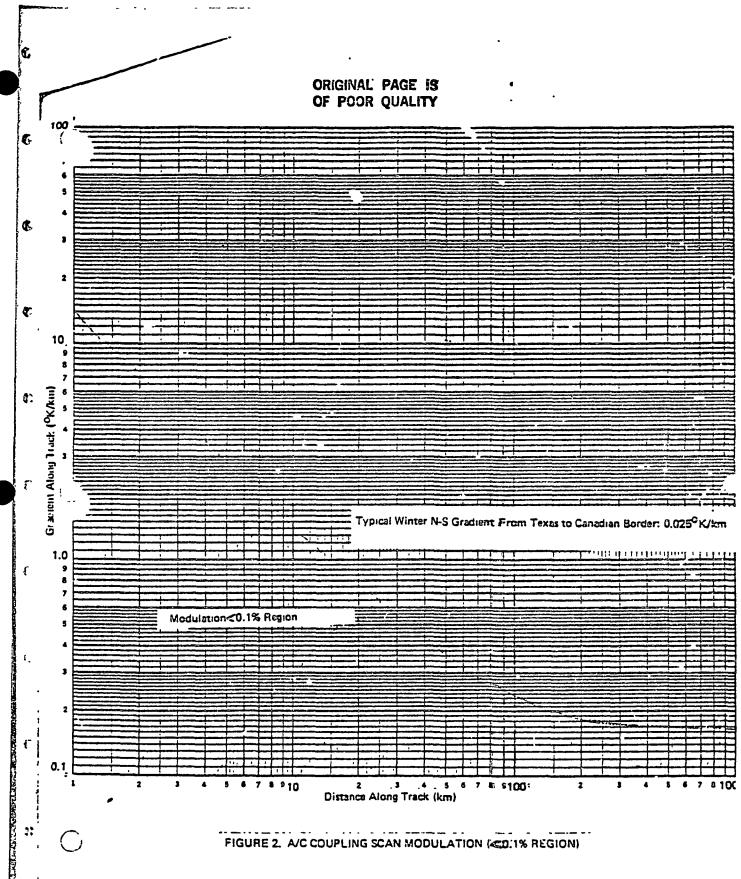
In-flight, significant along-track (i.e., north-south) average radiation temperature gradients will occur. These gradients will, in turn, cause the ac coupling contribution to band of modulation to be nonzero. Using the measured time constant (14 seconds), it is possible to examine the along-track gradient conditions under which the contribution will be less than 0.1 percent full scale.

To bound these conditions, it was assumed that at the average temperature along-track was constant until some point at which a gradient began. For a maximum 0.1 percent scan modulation, the relationship between the gradient and the distance over which the gradient extends is derived. The result is presented in Figure 2.

Below the curve in which the modulation equals 0.1 percent, the scan modulation will be less than 0.1 percent. At the line, the 0.1 percent subsystem specification will be equaled. Above the line, the specification will be exceeded.

Several features of the curve are of interest. Note that on the left hand side the curve begins to approach the line where the product of the gradient times the distance is 14°K. 14°K is the maximum increment for a step function without exceeding 0.1 percent modulation.

On the other hand, for gradients less than .0167° K/km, the 0.1 percent scan modulation limit will not be exceeded no matter how long the distance over which they extend. In this context, a relatively extreme average winter gradient from Texas to the Canadian Border would be about .025° K/km. Local gradients which are much higher, but extend for shorter



distances, would be common in the commental United States. The highest gradients would occur at land water interfaces.

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•	WAS	<u>IS</u>	WAS	IS	WAS	IS	WAS	IS	
1	7.9	5.7	10.0	10.0	0.70	0.45	1.00	1.00	
2	7.1	9.9	5.0	9.1	0.57	0.77	2.33	2.33	
3 .	3.3	3.2	7.7	7.8	0.46	0.25	1.35	1.35	
4 .	10.7	13.2	21.4	14.1	3.00	1.93	3.00	3.00	
5 7	2.3° 1.2	2.3 0.47	2.9 1.6	1.7 .41	0.58	0.40 0.12	0.6	0.6 .43	

The specified performance shall be achieved after application of a calibration that is the same for both test conditions. Verification that the instrument meets the requirements of this paragraph may be achieved through a combination of component testing (e.g. filter and detector response) and analysis.

## 3.2.9 Radiometric Requirements

## 3.2.9.1 Radiometric Sensitivity

The TM output in each of the bands 1 through 5 and 7 shall have a signal-to-n ratio (SNR) for specified input in accordance with Table IV. For a constant input radiance, the SNR is defined as the ratio of the output value (in units of radiance) averaged over at least one hundred samples to the root mean squared (RMS) value of the noise equivalent radiance which is defined as the RMS of the deviations of the output samples from the average value. All SNR measurements shall be taken with the processing electronics in a linear gain mode except for those bands where quantizing noise precludes meeting the SNR requirements.

## TABLE IV

Band No.	· Input Radiance · (mw/cm <sup>2</sup> -sr)	Minimum SNR
1	<b>0.28</b>	32
2	0.24	· 35
3	. 0.13	26
4	0.19	· 32
5	0.08	13
7	0.046	. 5
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poses when the Thematic Mapper is mounted on a spacecraft. The optical surfaces shall be polished optical flats of 1/4 wavelength quality with relectivity greater than 70 percent. All mirror surfaces on the cube shall a orthogonal to within = 5.0 arcsec. Normals to these surfaces shall be used to define the Thematic Mapper axes within 3 arcmin. One of these normals shall be set up parallel to the Thematic Mapper optical axis within 3 arcmin (873 µrad) and shall be known (measurable) to less than 300 µrad in each axis. The Thematic Mapper optical axis is defined at the midscan view of the nadir.

TABLE III. SPECIRAL MATCHING

•		Condit	ion I		Cendition	on II
Band No.	Spectral I Lower Bar mW/cm <sup>2</sup> -s			Radiance Band Edge, r-µm	Band Spectral 1 mW/cm <sup>2</sup> -si	
1	<u>WAS</u> 7.9	<u>is</u> 5.7 · ·	WAS 10.0	<u>IS</u> 10.0	WAS - 10.0	<u>IS</u> 6.43
· <b>2</b>	7.1	9.9	5.0	9.1 .	7.1	9.63
• 3	3.3	3.2 .	7.7	7.8	7.7	4.17
4 –	10.7	13.2	21.4	14.1	21.4	13.79
. <b>S</b>	2.3	2.3	2.9	1.7	2.9	2.00
7 ·	1.2	0.47	. 1.6	.41	1.6	.44

ror purposes of implementation, the center scan mirror locked position and end of scan hold positions may be used.

## . 3.3 Subsystem Requirements

## 3.3.1 Telescope Assembly

3.3.1.1 Optical Mecering Structure. The requirements for the optical metering structure are given in the specification 16085 and drawing 50841.

3.3.1.2 Primary Optics. The radiometer shall be designed with a two-element reflective optical system (Ritchey-Cretien) with the following basic characteristics:

Effective Focal Length 96.0 ± 0.15'inches

Diameter Primary Mirror 16.0 inches nominal

Diameter Secondary Mirror 5.3 inches nominal

Reflectivity, each mirror 94 percent minimum

Focal length/aperture 6

Useful collecting area 163.0 in<sup>2</sup>

Unvignetted field covers the detector array that is shown in figure 4.

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THEMATIC MAPPER INTERPACE CONTROL DRIVING 3533000-400 REVB

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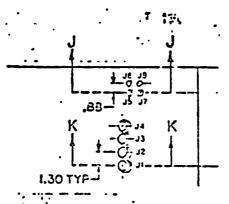
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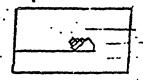


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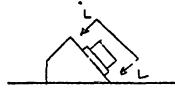
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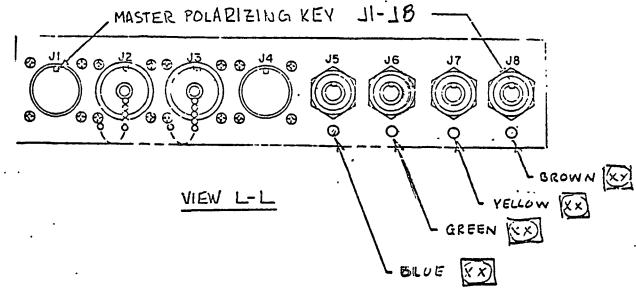
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## Add Note

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Paragraph 3.2.9.1 shall be changed to read as follows:

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### 3.2.9.1 Cadiometric Sensitivity

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1.

The TM output in each of the bands 1 through 5 and 7 shall have a signal-to-noise ratio (SNR) for specified input in accordance with Table IV. For a constant input radiance, the SNR is defined as the ratio of the output value (in units of radiance) averaged over at least one hundred samples to the root mean squared (RMS) value of the noise equivalent radiance which is defined as the RMS of the deviations of the output samples from the average value. All SNR measurements shall be taken with the processing electronics in a linear gain mode except for those bands where quantizing noise precludes meeting the SNR requirements.

TABLE IV

Band No.	Constant In Band Input Badiance (mw/cm -sr)	Minimum SNR
	(dw/cm 3t/	
1	0.28	32
2	0.24	35
3	0.13	26
4	0.19	32
5	0.08	13
7	0.046	5

The sensitivity of Band 6 is measured in terms of noise equivalent temperature difference (NETD) defined in 6.1. The NETD for Band 6 for an extended scene at a temperature of 300 K is 0.5 K. The minimum scene temperature for this band is 260 K.

The TM output shall have negligible coherent noise in all seven bands for all values of radiance including zero. The coherent noise pattern shall be subjectively evaluated by inspecting photographic images. No coherent noise pattern shall be discernible at any radiance/signal level with the display set so that each quantizing level from 0 to 1/4 of full scale is visible for Bands 1-5, 7 and 4 quantizing levels spread over the dynamic range are visible for Band 6.

Paragraph 4.2.3 shall be changed to read as follows:

#### 4.2.3 Pictorial Displays

AND THE PERSON TO

The contractor shall produce pictorial outputs using the BTCE or capital (facility) equipment.

The pictorial display used for testing all spectral bands may utilize a one dimensional target. The purpose of this test is to evaluate the coherent noise of the system, usually only obvious on an image and when viewing a mid-range, diffuse scene. The input radiance for this display shall increase slowly from 0 to full scale. The rate of change of radiance shall be slow enough to allow relatively constant levels of radiance for at least 10 scans. No coherent noise shall be visible. This type of noise is objectionable if it can be seen by the unaided eye of a trained observer in a picture that is at least eight inches on a side.

An acceptable alternative test method would involve scanning a scene with a radiance gradient which allows approximately ten samples at each quantizing level over the lowest 1/4 of the dynamic range for Bands 1-5, 7. Band 6 would involve scanning a scene with constant radiance for at least four different radiance levels spread over its dynamic range. No coherent noise shall be visible.

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SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company

ATTACHMENT TO ECP 14 - 8/27/80 Page 5 of 6

### INTERNAL MEMORANDUM

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CC: Data Bank (11)
Distribution

. DATE: 16 June 1980

REF: ES 236-6859

SUBJECT: Coherent Noise Testing

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BLDG. 761 MAIL STA. 79

EXT. 4262

Some deviations from the NASA Spec. are being implemented in BL-12R (Coherent Noise) testing. The method of testing relative to these changes is as follows:

- 1. A minimum of 64 pcm levels (0-64 MUX levels) rather than the full dynamic range will be required to be displayed (Bands 1-5, 7) for coherent noise testing.
- 2. The data pertinent to 1. (above) will be represented by differences from the intensity gradient.
- 3. Only 4 pcm levels, spread over the dynamic range, will be used in 3and 6 testing.
- 4. A pictorial format smaller than 8" x 8" will be used to display coherent noise pictures. (An attempt will be made to make the pictures as large as possible, consistent with the data quantity.)
- 5. Coherent noise in Band 6 will be tested in the Thermal Balance Test with a full aperture plate. This will only be performed on the Engineering Model. (We will not test in the Protoflight and Flight models due to probable elimination of the aperture plate.)

The rationale for the above changes is as follows:

Items 1 and 2 eliminate the need for the four-color option on the Optronics Laser Writer making the coherent noise pictures easier to read. (The four-color option is necessary since the film has only 64 distinct densities.)

Item 1, furthermore, eliminates a radiance gradient ramping problem. That is, the flooding lamp can deliver 0-54 MUX levels or greater, filling the entire video scan line. (Otherwise, we have to adjust lamp currents and the band may still saturate before the end of scan line.)

Item I also eliminates a lamp lifetime problem. (Presently, to get alies to the minimum suburation lavel, the outrent in the calibrator flooding lamp has to be so high that plating

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**ES 236-6859** 16 June 1980 Page 2

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of tungsten occurs on the envelope and the lamp lifetime is reduced.

Item 3 is necessary to eliminate collecting a large amount of data and producing a large number of pictures.

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Distribution:

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### Change GSPC 400.8 - D - 201, Section 4.5 as follows:

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1. Delete the last sentence in the section and add the following:

The themstic mapper mounting fasteners shall be the responsibility of the spacecraft contractor.

The spacecraft Instrument Module shall provide mounting surfaces to which the TM shall be installed. These mounting surfaces and TM mounting provisions shall conform to the requirements of the TM Interface Control Drawing, 3533000-400 and the requirements in Table 4.5, below.

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Table 4.5 Maximum Spacecraft Mounting Location Displacement

Environment	Maximum Out-of-Plane Displacement (inches)	Maximum In-Plane Displacement (inches)
At TM installation	0.001÷	0.002
During Launch	0.016	0.019
On-Orbit	0.004	·0.008

<sup>\*</sup> Limited shimming by the spacecraft contractor may be required.

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ECA 467313 ECR 831335 In IS32015-001, Paragraph 3.4.5: Delete the last two sentences and add following:

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The TM. mounting fasteners are the responsibility of the SPACECRAFT CONTRACTOR.

The spacecraft Instrument Module shall provide mounting surfaces to which the TM shall be installed. These mounting surfaces and TM mounting provisions shall conform to the requirements of the TM Interface Control Drawing, 3533000-400 and the requirements in Table 7.5, below.

Table 7.5 Maximum Spacecraft Mounting Location Displacements

Environment	Maximum Out-offlane Displacement (inches)	Maximum In-Plane Displacement (inches)
At TM Installation	0.001. ** .	0.005
. During Launch	0.016	0,019
on-orbit	0.004	0.008

<sup>\*</sup> Limited shimming by the spacecraft contractor may be required.

National Aeronautics and Space Administration

**Goddard Space Flight Center** Greenbelt, Maryland 20771

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1:

Hughes Aircraft Company Attention: Mr. E. A. Dawson Space and Communications Group NASA Systems Division P. O. Box 92919 Los Angeles, CA 90009

Subject: Contract NAS 5-24200, Engineering Change

Proposal (ECP) No. 16

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Hughes Aircraft Company (HAC) HS236/0019-1127, Reference:

dated December 12, 1980

The subject ECP has been reviewed by the NASA Goddard Space Flight Center (GSFC) and is rejected as submitted. The specification changes ploposed by HAC would require substantial additional explanation and the numbers in column 2 of Table III b) would have to be revised. Rather than HAC revising and resubmitting this ECP, we will initiate a Configuration Change Request (CCR) to be processed through the Landsat-D Configuration Control Board (CCB) to change the last sentence of Specification 400.8-D-210, section 3.2.8.1 from "component testing...and analysis" to "test and analysis." This change to the specification wording will allow HAC to proceed with the spectral matching test as Subsequent to approval of the CCR by the Landsat-D CCB, a contract modification will be issued incorporating this specification change.

I have been informed that the appropriate HAC technical personnel have concurred with the above. If there are any further questions on this subject, please do not hesitate to contact me.

Elizabeth Charton Elizabeth Austin

Landsat-D Project

Contracting Officer

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## ENGINEERING CHANGE PROPOSAL PAGE 2 OF 2 ECP NO. 017

DESCRIPTION OF PROPOSED CHANGES TO GSFC 400.8-D-201:

- 1. Section 3.3.2.1
  - A. Revise "...+ 7vdc..." to read "...+ 7vdc, 5vdc...".
- 2. Section 3.3.2.4
  - A. Revise "...(may not stay within the 21-25 volt operation range)" to read "...(may not stay within the 23-35 volt operation range)"
  - B. Revise "...(within the 21 to 35 volt operating range)" to read "...within the 23 to 35 volt operating range)".
- 3. Section 3.3.3.6

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A. Revise "...values of 35V, 28V and 21V." to read "...values of 35V, 28V and 23V."

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ENGINEERING CHANGE PROPOSAL	PAGE 2	OF _2_	ECP NO	. 018
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- 14. DESCRIPTION OF PROPOSED. CHANGE TO GSFC 400.8-D-210:
  - 1. Section 3.2.1 Configuration
    - a. Revise "...in no case shall this weight exceed 243.2 kg. (535 lbs.)." to read "...in no case shall this weight exceed 258 kg (568.8 lbs.)."

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OCORDINATION APPROVAL SIGNATURE:

CR Jongs. J.

bcc: Dist. B: GC Benson, EF Carle, AH Connor, RL Cook, RC Cooley, JL Engel. EA Daws WH Freudenstein, BF Gritt, RL Julian, JC Kodak, LE Long, JD Love, AB Marchant, KC Nas Wichols, FR Phillips, DM Randall, TP Sciacca, RJ Wilkerson, Data Bank (2), File

#### **HUGHES AIRCRAFT COMPANY**

SPACE AND COMMUNICATIONS GROUP EL SEGUNDO, CALIFORNIA

> ORIGINAL PAGE IS OF POOR QUALITY

17 June 198L

In reply refer to: 81(44)07001/D4596

HS236/0019-1287

National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt, Maryland 20771

Attention:

Elizabeth Austin

Contracting Officer

Code: 283

Subject:

Contract NAS5-24200 for Thematic Mapper;

Engineering Change 1 roposal (ECP) No. 019

Reference:

Hughes letter HS236/0019-1239, E. A. Dawson

to Elizabeth Austin, dated 8 May 1981

The subject Engineering Change Proposal (ECP), submitted on 8 May 1981, requested a revision to Specification GSFC 400.8-D-216, Revision B pertaining to shipment of the Thematic Mapper by Air Freight. The Hughes Program Office has initiated efforts to make the shipping container compatable with the shipment by air freight requirements. It is therefore requested that ECP Number C19 be cancelled, and that no further action be taken by the Goddard Configuration Control Board regarding this matter.

. If you have any questions, please call me.

Very truly yours,

HUGHES AIRCRAFT COMPANY

E. A. Dawson

Head, Contracts

NASA Systems Division

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ORIGINAL PAGE IS OF POOR QUALITY PROGRAMG ACTIVITY NO. MEINCERING CHANGE PROPOSAL (CHORF FOCAL) COP 140. CATE PURPAGE (व्य अध्यक्ताच्या ह्या ।क्राह्मताच्या) 020 20 August 1981 13. CASS :/ W J. 1711-7117 :. -3. 5.1 7315. . 154 AMM AND 15155 Œ₩. Eughes Aircraft Company 82577 4. STREIFICATIONS AFFICICE 7. BERTHARS AFFECTED SCHOOLIGA COMPANY NO. MARIE . we. coct GSFC GSFC 400.8-D-201 11 GSFC GSFC 400.8-0-210 S. CONTRACT NO. & LINE ITO B. TITLE OF CHANGE NAS 5-24200 Increase electrical power allocation for the Thematic Mapper. 19. CONFIGURATION ITDS MOSENCLATURE II. IN PROJUCTION XX YES 740 THEKATIC MAPPER 12. MANE OF PART OR LOWEST ASSOCRET AFFECTED OR THE DESIGNATION THEMATIC MAPPER 3533000-100 Revise GSFC 400.8-D-201, and GSFC 400.8-D-210 to increase the electrical power allocation to the Thematic Mapper as follows: Peak Power 400 Watts 350 Watts Maximum Average Power (Picture Mode)

15. HEED FOR CHANGE

Maximum Standby Power (Launch mode, no change)

During system testing, the engineering and protoflight models of the Thematic Mapper have consumed approximately 335 watt average power in the picture mode, and 94 watts in the standby mode. The present specification requirements are respectively 300 watts, and 75 watts. The GSFC technical personnel are aware of this condition, and have been advised that an engineering change proposal would be submitted to request that additional power be provided for Thematic Mapper.

100 Watts

Continued on Page 2

IN. EFFECT ON PRODUCTION DELIVERY SCHEDULE
NONE
20. ESTIMATED BUT OCLUTERY SCHOOLS
N/A
Program businager
DISAPPROVAL

ENGINEERING CHANGE PROPOSAL, PAGE 2 OF 2 ECP NO. 020

(Continued from Page 1, Block #14)

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 Description of proposed change to GSFC 400.8-D-201, Section 3.3.2.2, Power Output (available to Thematic Mapper).

REVISE: "Maximum operational - 300 watts" -- to read...

TO READ: "a. Peak Power: 400 watts

b. Maximum Average Power (Picture Mode): 350 watts

c. Maximum Standby Power: 100 watts

d. Launch Mode Power: 14 watts"

 Description of proposed change to GSFC 400.8-D-210, Section 3.3.43, Power Supply.

REVISE: "The basic power characteristics shall be in accordance with the ICD. Total power consumption of the TM instrument shall not exceed 300 watts, including thermal control power, if required. A non-operating orbital standby mode shall exist in which the TM consumes no more than 75 watts and is maintained at a temperature adequate to prevent instrument damage." -- to read...

TO READ: "The basic power characteristics shall be in accordance with the ICD. The peak power consumption of the TM instrument shall not exceed 400 watts, including thermal control power, if required. The maximum average power consumption of the TM in the picture mode shall not exceed 350 watts. A non-operating orbital standby mode shall exist in which the TM consumes no more than 100 watts, and is maintained at a temperature adequate to prevent instrument damage."

ISEE MIL-STD-481 FOR INSTRUCTIONS)	18 NOV 1	981	021	PROCURING ACTIVE		
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GSFC GSFC 400.8-D-201		11323	52347			<del> </del> B +
						278
Connection of Thematic Mar To Chassis Ground within Module	pper Unipoi			NAS 5-2	4200	
Thematic Mapper Assy				X ves	, ×0	
12. HAME OF MAT OR LOWEST ASSEMBLY AFFECTED		***************************************	13. PART NO. 00 1	TYPE DESIGNATION		
Electronics Module Assy-T	M		52347			
14. DESCRIPTION OF CHANGE						
Addition of 2 26 AWG wire ground) to physically near				Jnipoint s	ignal	
REF: Arrached SBRC EO 390						
18. HEED FOR CHANGE						
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ICX ** AR S	6010-E0008M	WIRE, INS	UL, ZGANG,	WHIZE
10/10/11	MS 35431-1	TERMINI	A LUG, NC.4	- 44

- 2. ADDED G/US
  - \*. SUBSEQUENT TO INSTALLATION OF ALL PWB ASSY'S INTO THE ELECTRONICS MODULE ASSEY BY (57347) VERIFY THAT OPEN CIRCUIT (> IMC) EXISTS BETWEEN SIGNAL UNIPOINT RTH (AZG EQI).
    - AT ONE END SOLDER TWO WIRES ITEM \* TO TERMINAL LUG ITEM \*\* AND THE OTHER ENDS OF THE WIRE TO AZG EQ! TERMINALS. LENGTH OF WIRES TO BE DETERMINED AT INSTALLATION USE EXISTING AZG ECARD MOUNTING HARDWAYE TO TIE DOWN TERMINAL LUG ITEM \*\* - (CONNECT THEMIATIC MAPPER UNIPOINT SIGNAL GROUND TO ELECTRONICS MODULE CHASSIS GROUND).

"X" NOTE AND/OR ITEM NUMBER TO BE ASSIGNED AT TIME OF INCORPORATION. SIAG RELEASED BY. PREPARED BY 5/-1!-! 1.71. --- - 2 , " 1 4 - 2 - - -11.17-50 CHECKED BY MANUFACTURING APPROVAL INCORPORATED BY DATE DATE 11/,-REA/RSA APPROVAL DATE DRAWING REV LETTER 1 A Banach 11/17/81

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	d SPECIFICATIONS APPECTED  MPR. COOR SPECIFICATION/OCCUMENT NO	•	MPR. CODE	7. 01	NUMBER		•		
	GGFC 400.8-D-210 Rev. B								
	Deletion of Power Supply Synchronization to the !!	Multiplexer			NASS-2420				
	Thematic Mapper System				X YES				
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## SANTA BARBARA RESEARCH CENTER A Subsidiary of Hugnes Aircreft Company

#### INTERNAL MEMORANDUM

TO F. R. Phillips

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cc. Distribution

DATE. 27 May 1982

REF: HS236-8006

SUBJECT: Tests on Fl TM Backup Shutter

FROM. N. F. Current

BLDG. B12 MAIL STA. 58

EXT. 6198

To confirm that the addition of the 3 ea.  $0.01_{\mu}F$  capacitors and the change in resistor R60 to 17.4K would have no unexpected bad effects on the operation of the system, a test was made this morning under FR's S 3128, 8129 and 8372.

At least five consecutive, successfully locking turn-on's were done (with no failures to lock) with the power supply sync lines open and closed and the scan line corrector on. Then the following timing measurements were made with the same conditions:

Test Procedure TP 32015-532, Paragraph

5.2.1.39 SME 1 SAM Mode.

5.2.1.46 SME 2 Bumper Mode.

5.2.1.51 SME 2 SAM Mode.

5.2.1.58 SME 1 Bumper Mode.

There were no failures to lock each time the Backup Shutter was turned on. All timing measurements were within specifications, as recorded on pp. 43 and 44 of the Fl System Test Log.

This test shows that the proposed circuit changes have no adverse effects on system operation. Accordingly, EO's 4432A and 4433A with their ECR's, Deviation/Waiver D153 and ECP 024 have been prepared to authorize the PWB changes and are ready for signature.

N. F. Current

NFC:are

Distribution

Brandshaft, D. G. Brown, A. C. Buckley, R. C. Cannon, G. W. Evans, L. B. Gritt, G. B. (NASA) Long, L. E.
O'Connell, L.
Plews, G. S.
/Sciacca, T. P. (NASTA)/
Young, D. (AF)

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SPACE AND COMMUNICATIONS GROUP EVILLIBE SEDUEL

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National Agronautics and Space Administration

**Goddard Space Flight Center** Greenbelt, Maryland 20771

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Santa Barbara Kesearch Center Attention: L. A. Dawson 75 Curomar Urive Goleta, CA 93017

Subject: Contract NAS5-24200 for Thematic Mapper, Approval of Deviation and ECP (GSFC CCR's 399 and 401)

The following deviations and waivers have been approved by the Landsat-D CCB.

U-153 - Capacitor addition to assure phase lock

ECY-U24 - Capacitor addition to assure phase lock

The signed DD 1693 and DD 1694 are enclosed for your files.

Elizabeth Austin

igheth Chitix.

Contracting Officer

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Santa Barbara Research Center 75 Coromar Drive, Goleta, CA 93117				11323	1 1			
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11469	51398. Rev. E	Duckup	11323	51399			Ĉ	
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#### 4.4 NON-CONFORMING MATERIAL

The following section lists the non-conforming material Reports (NCMR) that were generated during the Flight Model Fabrication tasks. Copies of the NCMR's are maintained at the contractor's facility and are available for review.

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NCMR's NO. 277572 - P/N 51480(A) - Frame Silicon DET and Preamp 277573 -50797(C) - Silicon DET and Preamp Assy. 277671 -50973(B) - Cold Focal Plane Assy. 277772 -50797 - Silicon DET. and PreAmp Assy. Band 1 277773 -52420 - Filter Retainer 277776 -50955 - Cooled Focal Plane 277777 -50958 - DET Array, Bands 5&7 InSb 277790 -50799-1(A) Quartz Substrate 277794 -50958 - Detector Array Band 7 277800 -50958(B) - Detector Array Band (-) 288469 -52451(A) - Filter Assy. - Band 1 294836 -51337(D) - Telescope Assembly 294837 -52249(F) - Redundant Shutter 294838 -508C9 - Substrate, LED Source 294839 -- Electronic Module 52347 294842 -- Aft Optics Assy. 51512 294852 -51672 Rev. A - Lens Spacer 294854 -52049 Rev C - Shim RAD Cooler Adapter 294859 -50980 Rev E - Cooled Focal Plane Housing Preamplifier 294861 -51740 Rev E - RAD Cooler Door Assy. 294862 -51740 Rev E - RAD Cooler Door Assy. 294888 -44220-2 - Mirror Mount 294889 -45769 Rev A - Nut plate 295099 -52347 Rev B - Elect. Module Assy. 298142 -- TLMY Scaling - fuse link Lamp 51402 298645 -50904-1 - Post Amp PWB Bundl 299608 -51337 Rev. A - Telescope Assy. 299663 -51337 Rev. D - Telescope Assy. - AFT Optics Assy. 299681 -51512 299684 -54211 Rev. A - Frame, Silicon Det. & PreAmp - Bracket 299686 -54180 Rev. A - Frame 299687 -51337 Rev. D - Telescope Assy. 90-50968 - Spare PWB Distribution Cold Focal Plane 359650 -359651 -51015(B) - Silicon Preamp Assy. 359652 -51015(D) - Silicon Preamp Assy. 359655 -50958(B) - Band 7 InSb Array 50973(B) - Cold Focal Plane Assy. 359661 -50802-1(E) - Substrate, Silicon Det. Preamp 359663 -359797 -- Filter Retainer 52420 51015-1(D) - Silicon Preamp Assy 359800 -50802-1 - Substrate E, Silicon Det. Preamp 360066 -360077 -- Prime FPA 50795 50903(E) - Flex Printed Wiring Cable 386729 -- Flex Printed Wiring Cable 386730 -51394 51209 Rev. D - Cover, Intermediate Stage 386755 -386757 -- Rad Cooler 51200 - Preamp Module Assy. 386758 -50980 386759 -52566-2(C) - SMA Strip Heater 51015-1(D) - Silicon Preamp Assy. 392151 -50797-1(E) - Silicon Detector and PreAmp Assy. 392154 ~ 50807-(H) - Led Source Silicon Focal Plane Assy. 392155 -392156 -- PWB, Distribution, Cold Focal Plane 50968(B) 392546 -51015-1(D) - Silicon Preamp Assv. 392547 -50973 (B) - Cold Focal Plane Assy.

- C.F.P./Cold Finger Assy.

NCMR'S

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NO.
     392555 - P/N
                   50958(B) - InSb Array
     392557 -
                   50797(D) - Silicon Detector and preamp Assy.
     393227 -
                   50973(B) - Cooled Focal Plane Assy.
                            - Flight Prime Focal Plane Assy.
     393244 -
                   50795
     393245 -
                   52421
                            - Flight Assy.
     393246 -
                   52421
                            - Filter Assy.
     393247 -
                   52421
                            - Filter Assy.
     393248 -
                   52421
                            - Filter Assy.
     393250 -
                   51015
                            - Silicon Preamp Assy.
     393251 ∸
                   50970
                            - FPWA Cooler Cable Band 5
     393252 -
                   50958
                            - InSb Det. Array Band 7
     393253 -
                   50958
                            - InSb Det. Array Band 5
     393254 -
                   51333-99C- Filter Mount Sub Assy, Spare
     393255 -
                   51333-98C- Tilter Mount Sub Assy, Spare
     393256 -
                   50795
                            - Silicon Focal Plane Assy.
     393261 -
                   50968
                            - PWB, Distribution, Cold Focal Plane
     393268 -
                   50961
                  (50955) (E) - Cooled Focal Plane Finger Assy.
     393269 -
                   50802
                  (50797)(E)- Silicon Detector and preamp Assy.
     393272 -
                   50992
                  (50973)(B)- Cold Focal Plane Alsy.
     393273 -
                   50797(E) - Silicon Delector and PreAmp Assy.
     393274 -
                  (50797-1)(E) - Silicoa Detector and PreAmp Assy.
     393275 -
                   50803
                  (50797)(E) - Silicon Detector and PreAmp Assy.
                   50973(B) - Cold Focal Plane Assy.
     393276 -
                   50797(E) - Silicoia Detector and PreAmp Assy.
     393277 -
     393278 -
                   50807(H) - LED source/silicon FPA
     393279 -
                   50802-1(E) - Substrate, Silicon Detector Preamp
                   50807(H) - LED source-silicon FPA
     393280 -
                   50955(E) - Cooled Focal Plane/Cold Finger Assy.
     393281 -
     393282 -
                   50955(E) - Cooled Focal Plane/Cold Finger Assy.
     393283 -
                   50955(E) - Cooled Focal Plane/Cold Finger Assy.
     411554 -
                   51402
                             - PWB Assy. Telemetry sealing
     411649 -
                   52797
                             - Aux. Circuit Board
     411881 -
                   53060 REV A - Analoy Processor (A4)
     411979 -
                   53286 REV D - Cable Assy. (W3) Heater and Sensor Band 6
     412432 -
                            - Telemetry Scaling PWB
                   51402
     412442 -
                   52788
                             - Cable Harness
     412446 -
                            - Silicon Detector PreAmp
                   50860
     412471 -
                   50916
                            - PWMB Assy. Cal Shutter Main
                            - CFP/Cold Finger Assy.
                   50955
     412473 -
                             - PWB Assy. Calib Mainshutter A6
                   50916
     412474 -
                   50904-3 - PWB Assy. Post Amp Band 1-4
     412478 -
                   52360
                             - Top Cover
                   53757 RLV B - Elect. Assy. Reg Module
     412487 -
     425451 -
                   50869
                             - Power Supply
                   509082-2 - PostAmp Band 7
     411836 -
     412016 -
                   50904
                             - PostAmp Bds.
                   50797-2 - Silicon DET and PreAmp Assy.
     392150 -
                   52052-3 - SHIM, Cooler Shroud
     386761 -
                   50904-4 - Post Amp Band 4
     412015 -
     411920 -
                   50904-2 - PWB Assy. Post Amp 1-4
```

## NCMR'S

No.	298649 - P/N	51065 -	Thematic Mapper Assy.
	299665 -		Shutter Arm Alsy - Cal/Restore
	412016 -		Post Arp. Bds.
	411836 -		Post Amp. Band 7
	299645 -		Aft Optics Assy. TM
	299630 -		Transformer Assy.
	412468 -		Electronic Module Assy.
	294814 -		AFT Optics Support